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TIMELINESS IN ELECTRIC-VEHICLE SALES.

"First Blizzard of Winter Blockades Traffic," was the headline in Chicago papers on Saturday evening, December 11, as the first snow storm of the season visited the city. Weather reports indicated that other sections of the country were affected and doubtless the traffic in many other cities was as seriously crippled as in Chicago. The horse, of course, is the worst sufferer. Most of the congestion and many of the accidents recorded in the newspaper accounts were caused by horses falling on the slippery pavements or becoming exhausted because of heavy pulling. In Chicago, on Saturday morning, six horses were seen down in the course of three blocks. In two instances the fall resulted seriously to the animals and in all other cases appreciable delays were necessary before normal operation could be resumed.

It would be difficult to conceive of a situation that could better emphasize the genuine worthiness of the electric truck. And yet it is doubtful whether advantage is taken of a time like this to bring the merits of the electric before the prospective user. Prompt transportation of goods, particularly at this season of the year, is of decided importance and no more opportune time for displacing of horses could be desired than when such a delivery system is crippled and the user is confronted with daily demonstrations of the inefficiency of the horse. The ability of the electric to negotiate heavy snows and to operate efficiently regardless of severe cold is not so well known as the electric-truck salesman may believe. It is probably in accordance with sales theories to tell the prospect who is visited in July that the battery vehicle will operate perfectly satisfactorily in winter, but the actual demonstration of this fact is what will count. Why would it not be feasible to have a list of such "summer" prospects and after the first snow place an electric at their disposal for a day, or week? At least give a demonstration to prove the claims made. Or what better list of prospects could be desired than the names of the firms operating horse-drawn wagons which have experienced accidents or delays because of horses falling on slippery pavements, etc. A salesman could hardly occupy his time to better advantage than by collecting such names during the inclement weather, and while it may be pressing matters too closely to visit a prospect on the same day that some accident has incapacitated his delivery, nevertheless the visit should be made while the occurrence is still fresh in his mind.

CONVENIENCE OF ELECTRICAL SERVICE.

As civilization advances, convenience becomes more and more valuable as a factor in accomplishment. Whatever saves time and trouble pays for its development in an age like this. Every user of electricity enjoys its convenience whether he thinks about it or not. Formerly, in many electrical applications, the cost of service was as great if not greater than the expense of utilizing its competitors, but, even so, electrical methods grew in popularity, installations multiplied, and less convenient services gave way, often when their cost was somewhat less than that of electrical operation.

Today electrical service is actually cheaper in a vast number of cases than any possible substitute, but its convenience is greater than ever. We spend money today to save larger outlays, and it is economic wisdom so to do. A factory driven by steam power, belts and shafting finds that its production can be increased 10 to 15 per cent by scrapping the mechanical installation and purchasing motors. This may mean that the cost per unit of product decreases, and usually it does; but even if it means that the manufacturing cost increases slightly through the addition of something in fixed charges, or overhead expense, it may be the only wise policy to get rid of the older equipment in favor of the newer, since by the use of the latter the total volume of sales can be increased and the total profits at the end of the year swelled. Fortunately, the efficiency of the electric drive is so great when laid out according to engineering principles and studies, that an actual decrease in cost may generally be expected.

Manufacturing engineers designing electric appliances are paying more attention than ever to the factor of convenience, and they are sure to reap their due reward. Witness the provision of cord switches to enable flatirons to be cut out of service without moving from the ironing board; the application of a low-powered incandescent lamp for the front of the iron in cases where the kitchen has but a single outlet; the equipment of toasters with means for turning the bread without burning the fingers; development of the "flashlight pencil" for use in stereopticon lectures; provision of telephone sets for taxicab service; design of motor driven ink erasers for the drafting room, and so on. Almost every advance in appliance design embodies some new gain in convenience; makes the use of electricity easier, safeguards continuity of service in some way, lightens weight, or minimizes complication.

Whether one sells central-station service, telephone communication or rapid transit, the principle is the same. Important as economy is in the industrial future of this country, we have still a long way to go before the development stage settles down into the intensive and acute competitive production which exerted such pressure upon the proletariat of Europe before the beginning of the great war. Here, instead of stimulating the hoarding of funds, the opportunities are inclined to call them forth for courageous investment. We can afford to spend money to save time, in order that we may thereby produce in larger volume. Hence arises the growing practice of making appointments by telephone instead of by mail, boarding an electric car for a few blocks to save two or three minutes in the stress of mid-afternoon, and the use of the electric fan in rushing the drying of photographic negatives in the commercial studio. All of these practices cost something, but they are worth the price, enable the world to do more work in a given time, and thus are not only justified from the economic standpoint, but are neglected at the peril of the user's success. That low cost of operation goes hand-in-hand with convenience is one of the chief causes for thankfulness within the electrical industry, but even where costs are not materially lowered by the use of electrical conveniences, improvement in the quality or increase in the volume of work done almost invariably follows.

The opportunity to render electrical service of all kinds still more convenient is so great as to deserve even more attention than it is getting. The day is coming when the provision of but a single electric service outlet in a residence room will be looked upon by the modern architect as a practice of the past. No more important work lies ahead of the central-station manager than the cultivation of such relations with architects as will lead to the specification of multiplied outlets in new buildings. In publicity work emphasizing the value of small motors, in planning schedules of car service, locating telephone pay stations, and in countless other ways, a systematic effort can be made to develop the convenience of electrical applications, to the lasting good of the consumer and the industry.

IMPROVING GROUP DRIVES.

For many years to come the group driving of machinery by electric motors is likely to hold its own in successful installations, thanks to the longevity of the electrical equipment, which continues to run at good efficiency in numerous instances which illustrate from ten to twenty years of service. The strong tendency toward individual motors is not overlooked in this thought, but few equipment investments have proved to be more permanent or more satisfactory than capital outlays in well considered group drives associated with the earlier days of electric power application.

Improvement of group drives therefore deserves consideration. The mechanical maintenance of first-class shafting conditions goes without saying as essential to good modern practice and need not be discussed. A recent trip through a famous manufacturing plant driven almost entirely by the group system—and therefore of little interest as a mere example of electric application, considering the peculiarities of the local shafting arrangement—disclosed an excellent opportunity to improve the service by making a survey of the clearances between machines, walls, motors and aisles. "Safety First" has received merited attention in this installation, but conditions might be still further bettered by the simple plan of analyzing the spacing be-

tween machines, noting the opportunities for simplifying belt and shafting arrangements and looking to it that starting boxes, switches and fuse blocks are well out of the usual path of travel.

The importance of a speedy resumption of service is very great in most group-driven installations, and here extra inclosed fuses are kept on the starting boxes to minimize the delay in case of a "blow." Too many machines are involved in the stopping of a 50-horsepower or even a 15-horsepower motor, to shut down any longer than is absolutely necessary in case a fuse opens the line, and the time taken to summon one of the electrical staff with a substitute fuse is not to be permitted under many conditions. Other suggested improvements are the re-location of disconnecting switches now on ceilings and consequently rather inaccessible, the marking of switches with the motors controlled, and the training of all skilled employees to insert inclosed fuses as occasion requires, to report any unusual conditions in the operation of the drives, and to recommend any betterments in the grouping of tools assembled for operation by a single motor.

ANALYZING ELECTRICAL ACCIDENTS.

In the popular mind electricity is regarded as a dangerous agency and it is expected that accidents will be met wherever this form of energy is employed. There is consequently a general readiness to ascribe to electrical cause any fire the origin of which is unknown if there be on the premises any wires which may be assumed to have gotten crossed. There is also a popular fear of high-voltage shock.

Those familiar with electrical work realize that fires and personal accidents are not so numerous as is generally supposed and that, for instance, accidents among central-station employees are in much larger proportion due to mechanical than electrical causes. This very knowledge that electrical work is not so dangerous as is popularly supposed undoubtedly leads many electrical workers to be careless and omit proper precautions when working with high-tension lines or apparatus. Probably more electrical accidents are due to carelessness than to any one other cause.

To avoid accidents most effectively it is essential to know what accidents are happening elsewhere and what are their causes. There does not appear to be at this time any agency in the United States which collects complete data on this subject. There are various organized bodies interested in safety measures and accident prevention, but we know of none that completely covers the field of electrical accidents. Liability insurance companies keep records of accidents occurring among employees of their policy holders, but such data are of course incomplete.

In this issue there is abstracted from the report of the British electrical inspector of factories some data regarding electrical accidents in that country and such an analysis undoubtedly aids in the prevention of future accidents. It would be of great value if a similar comprehensive compilation could be made by some agency, either private or governmental, in this country.

THE AMERICAN ASSOCIATION OF ENGINEERS.

It sometimes seems as if there were already too many engineering societies, and some engineers of diversified interests have wished that activities of this kind might be more concentrated. Nevertheless new organizations keep springing up and if they survive it must be taken as evidence of their right to existence. Unless they serve some need of their members they are not likely to receive continued support.

The latest claimant to the support of engineers is the American Association of Engineers, which has been organized during the present year with headquarters in Chicago, and last week held its first convention in that city. This was naturally occupied principally with organization and routine matters, and the large attendance at the closing session on Saturday afternoon indicated an encouraging interest, at least on the part of local engineers.

It has been estimated by one of the officers of the new organization that there are at present about 40,000 engineers connected with national and local engineering societies and about 60,000 men doing work of an engineering nature who are not affiliated with any society of that kind. This would include many draftsmen, assistant engineers and men holding minor positions of a similar nature, who have grown into the work without realizing that they have a common interest with others engaged in doing work of a technical or engineering nature. Undoubtedly solidarity among the individuals composing this army would be good for the individuals, for the engineering profession and for the public. This assumes, of course, that the ideals to which the power of co-operation are to be applied are proper ones. Any such organization, to succeed, should have the public welfare, as well as individual benefit, at heart. Much may be done for both. The public little realizes what the engineer can and does do for it, and the engineer seldom receives the recognition which his work deserves. The national professional engineering societies are mainly occupied with professional problems. There is a large body of men doing engineering work who lack organization. There is an opportunity for these men to benefit themselves and to improve relations with the public.

Any new society which is able to accomplish these ends, even if it does no more, will have sufficiently justified itself. Its success must depend upon the co-operation of the men whom its leaders are endeavoring to organize. No engineer should deny them a hearing, although he should be satisfied that a new association brings promise of some real accomplishment before giving it his support.

Convention of American Association of Engineers.

The American Association of Engineers held its first convention at the La Salle Hotel, Chicago, on December 10 and 11. At the opening session on Friday morning addresses were made by H. S. Baker, President W. D. Wilcox and F. H. Newell, professor of civil engineering in the University of Illinois. Secretary Arthur Kneisel made a report of the work so far accomplished, which has included connecting a number of men with vacant positions. The present membership of the association is about 325.

At the afternoon session T. B. Lambert spoke on "Qualifications.' At the banquet in the evening addresses were made by Everett Jennings and H. B. Wild.

At the sessions on Saturday reports of committees were acted upon and organization perfected. The following addresses were made: "Relation of Patent Rights to the Engineer," by G. Willard Rich; "Selling A. A. E. Memberships to Engineers," by A. H. Krom; "The Economic Aspects of Engineering Pay," by J. H. Prior.

The headquarters of the Association are at 29 South La Salle Street, Chicago. The annual dues are $10 and the objects are stated to be "to raise the standards of ethics of the engineering profession and to promote the economic and social welfare of engineers." These aims are to be accomplished by affording means for the interchange of information; by maintaining a service clearing house; by affording patent and legal advice; by supervision of legislation, and by proper publicity.

Electric Club of Chicago Elects Officers.

The annual election of officers of the Electric Club Jovian League of Chicago took place at the regular meeting of that organization on December 9 and resulted in the following being elected:

President, Victor H. Tousley.
First vice-president, H. A. Mott.
Second vice-president, J. C. Manley.
Secretary, L. C. Spake.
Treasurer, Howard Ehrlich.

Trustees: For one year, J. N. Pierce; for two years, A. J. McGivern; for three years, R. I. Phillips. An amendment to the constitution was passed providing for paying the secretary a salary for his services.

John Z. White was the speaker of the day, delivering a very interesting address, entitled "Free Trade," in which he held that the real basis of preparedness for defense, was in being able to supply the needs of an army or navy in times of strife. This necessitates a readjustment of the present method of taxing industry and elimination of a high tariff even for revenue. Revenue, he thought, should be derived from taxing land values instead.

Philadelphia Section Activities.

"Self-advancement," a fitting sequel to President McCall's talk on "Preparedness," was the title of a splendid address made by Douglass Burnett, commercial manager of the Consolidated Gas, Electric Light and Power Company, of Baltimore, at the November meeting of the Philadelphia Electric Company, Section of the National Electric Light Association, held in the New Century Drawing Rooms on November 15. The usual entertainment concluded the evening's program.

"Sign Leads" by E. S. Pelling, and "Charging Sets and Refrigeration" by R. L. Lloyd, were the titles of papers read at the November meeting of the Commercial Department Branch. Both of these papers gave evidence of careful thought and provoked free discussion.

The announcement that a prize would be given for the best interpretation of C. J. Russell's paper of the preceding month, "Systematic Sales Effort" results in seven papers being presented. The papers were well written and it was shown that Mr. Russell's ideas on this subject have been properly grasped. Gilbert Coe was the winner of the prize, a handsome scarf pin, and George Lovett received honorable mention.

Robert J. Milligan, chief electrical draftsman of the Station Construction Department of the company, addressed the Engineering Branch at its December meeting on "The Electrical Design of Our Stations." The speaker treated the subject under three headings; namely, new design where there are no property limitations; new design where there are property limitations; and new design in an old station. The talk was illustrated by lantern slides and an interesting and lively discussion then followed.

Lynn Section Meeting.

At a special meeting of the Lynn Section, American Institute Electrical Engineers on December 7, Frank P. Cox gave an illustrated lecture on "Recent Developments in Meters and Instruments. The address was of value in showing the growth of inventive effort in perfecting mechanism for the measurement of electricity.

Mr. Cox showed some remarkable refinements of recent effort in metering. A full line of the meters and instruments described were placed on tables in the lecture room, which were inspected before the address and at its close.

Hydroelectric Development on Public Domain.

In his annual report, Secretary of the Interior Lane refers to water-power development and the desirability of making power sites available as soon as possible. Of the Ferris bill he says:

"This bill was called for by the fact that existing legislation permitted only a revocable permit to be granted for such use, and this was regarded by engineers and financiers as too tentative and hazardous a tenure where millions of money were needed for the installation of the plant.

"The Ferris bill meets this difficulty by proposing a lease of these lands for a definite term of 50 years. The objection is made that the lands should be given outright. To this there are several answers of substance: No enlightened government gives such a franchise. There is danger, very real danger, too, of a complete monopolization of such power sites if the lands go forever from the people. The value of water power is not yet fully realized, and its full value can not be known at this stage in our industrial life. The purpose of the government in transferring these lands is to secure their use, because it does not choose to use them itself, but the time may come when it may be most desirable to the full development of our life that they shall be operated by the nation or the states or the municipalities in the states, and to transfer them forever would cast a burden upon the future which would be unforgivable, and is, moreover, unnecessary.

"The fear is expressed that by the imposition of charges for the use of the land an undue and unjust burden will be cast upon the people. The basis of this fear has not been discovered. Congress may, of course, if it so desire, fix absolutely the charge that shall be made, and if this were done the charge should be so low as to make the added burden upon the consumer, if any, an infinitesimal one; perhaps first a free period when no charge would be made, and then one-tenth of a mill per kilowatt-hour for a period and two-tenths of a mill later."

Illuminating Council Meeting.

At a meeting of the Council of the Illuminating Engineering Society held on December 9, E. P. Hyde, director of the Nela Research Laboratory, was appointed chairman of the Committee on Lectures. The Society is arranging for a course of lectures in illuminating engineering to be given in the fall of 1916. The University of Pennsylvania has invited the society to give the course there.

W. A. Durgin was appointed chairman of the Membership Committee.

STEAM-ELECTRIC POWER PLANT OF ALASKA MINE.

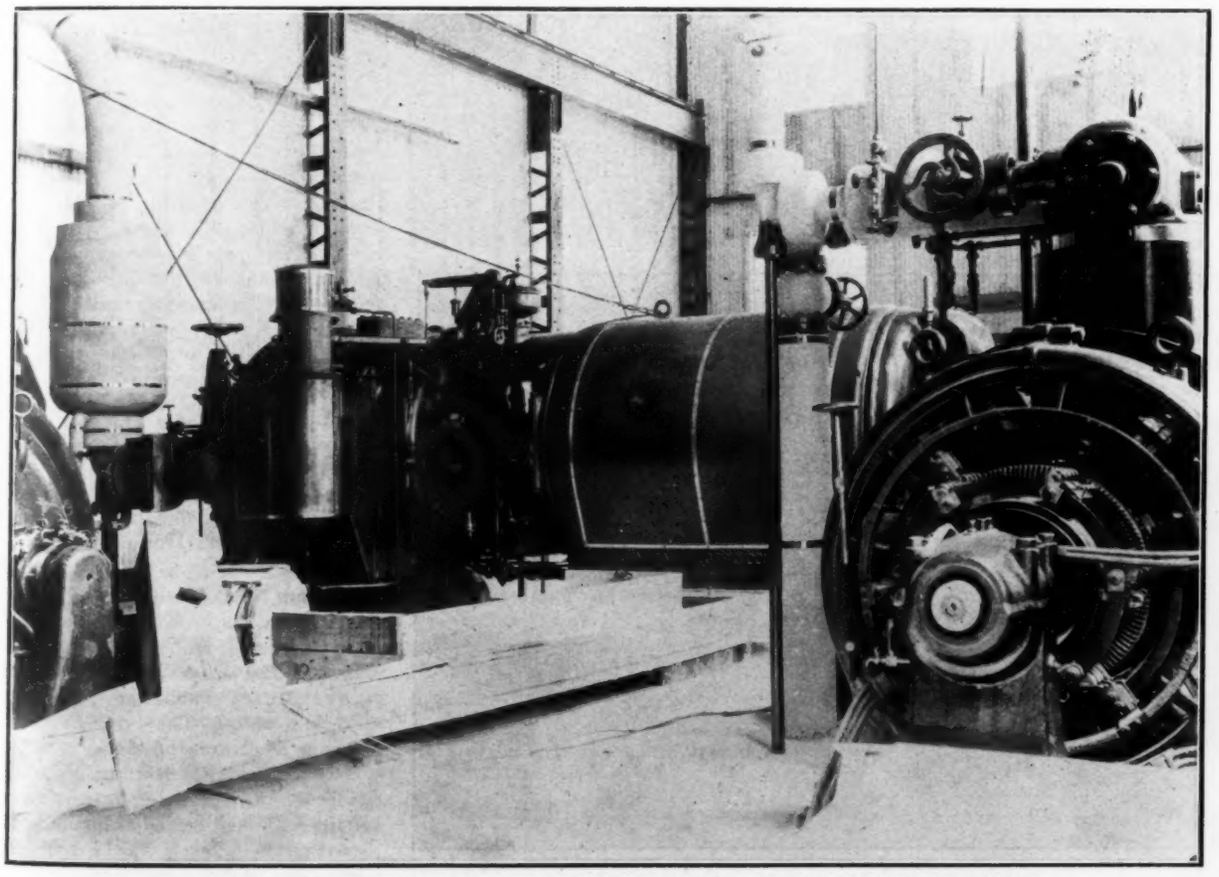
Interesting Details of Recent Installation.

In a remote district of frigid Alaska a large gold mine is being operated exclusively by means of electric power. Hydroelectric energy is supplemented by power from an oil-burning steam-electric plant which embodies many interesting features. The latter plant, recently completed, is described herewith.

In June, 1914, the Alaska Treadwell Gold Mining Company, of Treadwell, Alaska, erected a power-plant building and installed a steam-electric power plant which is a model of simplicity and, to date, has given excellent service. Its satisfactory operation reflects credit on the efficient manner in which it is being handled by the operators under the direction of P. R. Bradley, general superintendent of the Mining Company, who is in complete charge of all the company's work in Alaska.

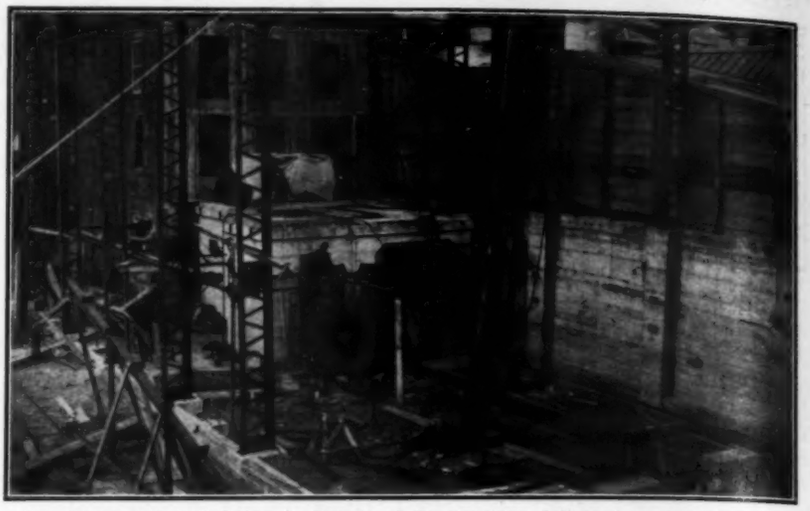
The power plant is located at the great mines of the Alaska Treadwell Company on Douglas Island, at Treadwell. The site is at the shore end of the Treadwell wharf, on Gastineau channel. Along this waterfront are the several mills, mine shafts and many other buildings of the company. The mine workings of the company are at a depth of 1,200 to 2,200 feet and extend hundreds of feet eastward under the channel, as well as westward into the base of the mountain, which has a trend parallel to the channel. The Treadwell mining group has long been considered the largest low-grade gold mining project in the world, with the exception of some of the mines in South Africa. For more than a quarter of a century this mine has been yielding a large tonnage of low-grade gold ore, requiring milling on the ground, the reduction process being stamp-milling, plate amalgamation and concentration. Hundreds of stamps and concentrators are in use, air-compressors are required for operating power drills, tramways, conveyors, crushers, mine hoists and shop machinery are included in the operating equipment of this great industry that continually employs from 2,000 to 2,500 men. The driving of the machinery for these processes involves the important problem of continuous and uninterrupted power. As the mining and milling operations have increased in magnitude, the power facilities have been developed to meet the demands. These comprise steam power direct, water power developed through individual water wheels, available in the summer season; steam-electric and hydroelectric power for motor-driven machines.

Originally the individual mills and compressors were operated during the summer season by water power secured by an expensive ditch system encircling the north and east sides of



Power Plant of Alaska Mine, Showing 2,000-Kilowatt Turbogenerator in Course of Installation.

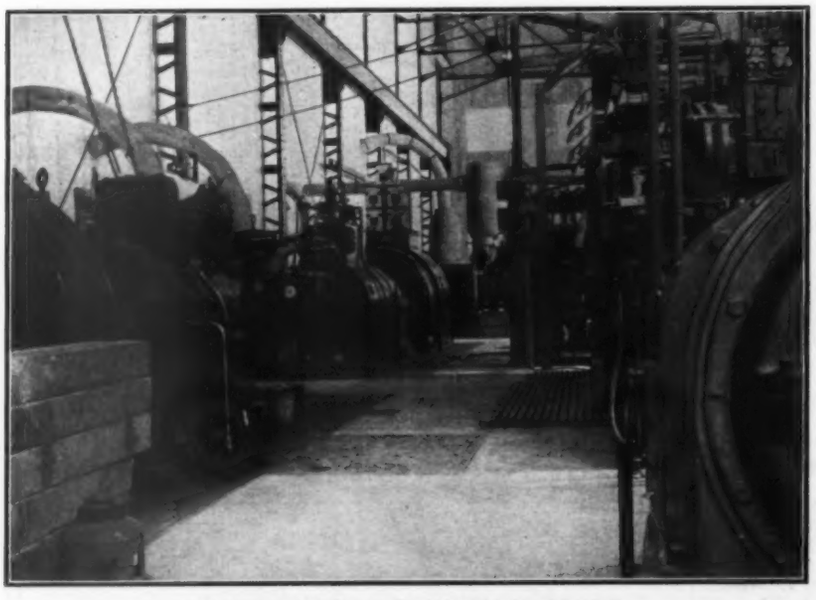
Douglas Island, at an elevation which made possible the bringing of most of the surface water to penstocks above the various mills. These penstocks lead to water wheels of the Pelton type, which operate the great machinery. During the cooler weather of the winter months the supply of water available from this source is very much decreased, due to the freezing up of streams and the prevalence of snow instead of rain. This made necessary the equipment of the plant with additional sources of power, which were supplied by providing steam-driven units, arranged to either supplement the water wheels or entirely supplant them during periods of water shortage.



New Power-Plant Building in Course of Construction Adjacent to Old Structure.

As the power requirements still further increased a separate water-power plant was developed near the face of the Mendenhall glacier on Nugget Creek. This plant is located some 15 miles from the mines, and the electrical energy developed there is sent to the mines and mills at Treadwell, on Douglas Island, from Nugget Creek on the mainland, over a transmission line paralleling the shore of the mainland until it reaches Juneau, where it crosses the Gastineau channel on high towers and then follows the east coast of the Island to the substation in Treadwell, from which it is distributed to the different points of usage. The output of this plant, however, is also limited during certain months of the year.

It therefore became necessary in 1909 to construct an additional auxiliary source of power. In keeping with the advancements of the art, it was decided at this time to electrify wherever possible, and as a consequence the new auxiliary steam station took form as an electric generating plant, having as prime movers two 800-kilowatt steam turbogenerators. These were supplied with steam by four 250-horsepower boilers. The steam, after leaving the boilers, was conveyed through a separately fired superheater in which it was superheated 125 degree Fahrenheit. The exhaust from the turbines was condensed in steam-turbine-driven LeBlanc condensers. These were jet condensers in which the condensed steam mingled with the circulating water. The balance of the plant equipment, consisting of auxiliaries and piping necessary for the satisfactory operation of the plant, were installed. The building was of special construction and proved so satisfactory under trying weather conditions that the same type of construction was later used in the large building later constructed to house the enlarged plant. Switching equipment was also provided at this time, and part of the building was devoted to a small motor-generator set used for charging batteries for the storage-battery locomotives, of which there are several on Douglas Island.



Interior of Old Plant, Showing Turbogenerators.

Early in the year 1914, it was decided to greatly enlarge the plant, and the purpose of this article is to describe this enlargement and the modifications of the existing plant. The enlargements were made necessary by the determination of the Treadwell Company to electrify a number of its tramways, increase the use of storage-battery locomotives, motor-driven compressors, formerly steam driven, and in general to continue the electrification of the whole property. Further increase in power was made necessary by the development work at new and lower levels. These contemplated improvements necessitated the tearing away of the building which housed the original plant, erecting a new and larger building in its place, and installing new equipment supplementary to the old machinery then in place. The plan required the performance of this construction and installation work without seriously interfering with the operation of the original plant, and under conditions which required the services of an organization thoroughly skilled in the design and construction of modern power plants of the most economical type.

Power House.

The new building was built to house the entire installation, constituting as a whole a serviceable and reliable plant of specified operating capacities, and providing space for further future enlargement to an ultimate capacity of 8,000 kilowatts. The structure occupies a ground area of 104 by 145 feet, and consists of steel frame, with latticed columns, resting upon reinforced-concrete foundations, designed to take the several units of the installation. The side walls are specially con-

View of Construction Work Incident to New Plant. Original Plant Remains in Place.

structed to withstand severe climatic conditions, and are built up of mill board and asbestos paper in the center, with an exterior sheath of corrugated galvanized iron, and an interior siding of specially prepared galvanized iron. These materials are all held in position and stiffened by angle-iron framing running vertically and horizontally and fastened to the steel frame. The air space construction with double walls satisfactorily resists the transfer of heat and effectively prevents the interior sweating of walls, so often found in power plants where the outside is at low temperature and the interior is much warmer and contains a considerable amount of moisture in suspension. The floors are of reinforced concrete. The roof structure consists of 10 built-up steel trusses, supporting steel purlins. The roof itself, corresponding to the sidewall, is built up with wire netting placed on the purlins, then a layer of asbestos board 0.25-inch thick, this being overlaid with two thicknesses of tar paper, with an exterior covering of corrugated galvanized iron. Large overlaps are provided on all galvanized iron to reduce to a minimum the possibility of rain beating in with the driving force of the powerful Taku winds. The entire interior is divided into nine bays by the 30 latticed-steel columns, constituting the building frame work. The building is divided longitudinally by a reinforced-concrete wall, separating the turbine room from the boiler room. This wall provides a convenient and sturdy support for pipe hangers, anchorages and sliding supports for the high-pressure steam header paralleling the wall.

The equipment installed in the new building comprises three 512-horsepower water-tube boilers; 12 special Hammel oil furnaces, and Hammel oil burners for this type of boiler; three superheaters; one surface condenser; one automatic exciter engine; one 50-kilowatt direct-current exciter generator; two vertical centrifugal circulating pumps, and two vertical motors for operating them; one 750-kilowatt Curtis turbogenerator; one 2,000-kilowatt turbogenerator; one open-type feed-water heater; two Smith-Vail specially fitted fuel-oil pumps; one special oil heater, feed-water meter and fuel oil meter; two steel stacks and three steel breechings; magnesia coverings for boiler drums, for separators and heater bodies; boiler brick work, designs for foundations for boilers, turbines and auxiliaries; and all accessory equipment and fittings.

The new 2,000-kilowatt turbogenerator is of the latest type, horizontal and utilizes the steam on the impulse principle. It is very rugged in construction and has already proven its ability to carry heavy loads economically. The governor is of the latest type, doing away with the top control of admission valves, and allowing the closest regulation. Graphical records of the speed are kept by a special meter recording the cycles at which the system is operating and when this unit is in service great and marked improvement in the regulation is apparent. The turbine is of the new type without bed plate and its pleasing appearance is shown in one of the accompanying illustrations.

The three boilers furnished are of the well known Stirling type, each consisting of three steam and water drums and one mud drum connected by three banks of hot-drawn seamless steel tubes of proper curvature which form the heating surface. These boilers are designed for 180 pounds per square inch working steam pressure, and the drums are of heavy steel plate, with double-riveted, double-butt strapped joints. The boilers are arranged and mounted two in one battery and one set singly. The furnace structure is especially designed for the economical combustion of California crude oils. In the furnaces the burner head is recessed in the bridge wall, permitting the flame to shoot forward. The furnace is so constructed that it increases in size in the same direction as expansion of the flame, this giving a maximum furnace volume with a minimum of radiating surface, and permitting large overload capacities without unduly damaging the brick work or seriously affecting the life of the boiler tubes. It obviates the tendency to localize the heat. The furnace floor is supported by I-beams, the front part being blanked off solid with firebrick, while the back part provides a checker work through which air is admitted for combustion. With this design, the amount of air can be carefully regulated as required for economical opera-

Battery of Oil-Burning Furnaces and Boilers in New Station.

tion by both the front and rear dampers.

The three Babcock & Wilcox superheaters, especially designed for Stirling boilers, located between the first and second passes, are designed to give a superheat of from 125 to 140 degrees Fahrenheit at the superheater nozzle when boilers are operated at or above rating. These superheaters consist of two cross boxes connected by seamless steel tubes, hand holes being provided in cross boxes opposite tube ends. There are no corrugated rings or other obstructions to the rapid transfer of heat, and the smooth surfaces permit of easy regulation and thorough cleaning. The cross boxes are connected to the saturated steam nozzle and to superheater steam nozzle on the side of boiler setting. Special superheaters were also put in for the newly installed Heine boilers, designed to give from 125 to 140 degrees Fahrenheit superheat at the superheater nozzle when boilers are operating at about rating. They consist of cross boxes, connected by tubing forming the superheater surface, provision having been made for expansion and contraction in tubes.

The surface condenser for the 2,000-kilowatt Curtis turbogenerator has a rectangular shell and contains 3,446 square feet of cooling surface, made up of brass tubing 10 feet long, 0.75 inch outside diameter. The condenser is of the standard two-pass type, circulating water entering at the bottom and discharging out of the top pass, making the condenser of the counter-current principle. The shell is of cast-iron, of rectangular section, and has ribbing to resist external air pressure, and internal pressure due to operating the turbine non-condensing with atmospheric exhaust through relief valve. The tube plates are of rolled brass. In the top of the condenser shell is a separate pass known as a Volz heater. The condensate is pumped through this by tail pumps, thus securing an additional five degrees in temperature of feed-water.

The condenser is served by a steam-driven double-cylinder air pump, of the Edwards patent suction, valveless type. In this air pump all suction valves are dispensed with. The condensed steam and non-condensible vapors flow continuously by gravity from the condenser to the base of the pump and are removed by a conical bucket or piston, which works in a base of similar shape. By the action of the bucket, the water is projected without shock at a high velocity through the ports which are cast in the sides of the working barrel. This rising water is followed by a rising bucket, closing the ports and forcing the water and air through the discharge valves of the pump. The condensing equipment used on the 750-kilowatt turbogenerator is of the same general type as that for the large unit, though of smaller surface. It is served by a single-cylinder steam-driven Edwards air pump.

Two Platt vertical centrifugal circulating pumps, installed at caisson near wharf, are of the single-stage, double-suction, split-casing type, each capable of pumping 2,700 gallons of water per minute against a head of 35 feet. These pumps are operated by two 50-horsepower, 60-cycle, three-phase, 2,300-volt induction motors of vertical type running at 1,160 revolutions per minute, direct-connected through intermediate shafting. The extreme tidal range made necessary the use of vertical pumps and the placing of these pumps in a concrete caisson. This caisson was made of Lackawanna steel piling driven to bedrock and then connected in place. The pumps are located below extreme low water so that the water will flow into the suction inlets at all conditions of the tide. The long intermediate shafting between the pumps and the motors are carefully lined in place, are of ample diameter and secured at frequent intervals by liberally proportioned steady bearings.

The automatic horizontal high-speed engine for driving exciter generator has an 8.5-inch diameter steam cylinder, with 12-inch stroke, and operates at 300 revolutions per minute. It is of the self-oiling type. It is equipped with combination governor, and flywheel 51 inches in diameter with 11-inch face. The engine has heavy and substantial bed-plates connecting generator to engine frame. Direct-connected to this engine is a 50-kilowatt direct-current exciter generator, designed for operating at 300 revolutions per minute and furnishing excitation current at 125 volts.

The two steel stacks serving the plant are each 7 feet in diameter and 130 feet high above the boiler-room floor. Each stack is placed upon and supported by angle-iron base rings. The stacks are made of extra heavy plate to resist the action of the elements, and to secure as long a life as possible.

The open-type feed-water heater, rated at 4,600 horsepower, is of the two-section type; the shell is of cast-iron, made up in sections with joints machined and fitted with indestructible gaskets. This type of heater has a number of pans, or trays, with overflowing weirs the full length, bringing the water into contact with the steam. The filtering chambers, arranged according to the Stilwell method, handle the lighter impurities in the feed water, the heavier particles being deposited in the settling chamber below.

The feed-water meter is of the Venturi type. This meter has a recording chart on which the amount of water being supplied the boilers is indicated by a curve. In addition to this, there is a register dial, on the same principle as the register dial of a gas meter, which shows the accumulated totals of the volumes of water being supplied the boilers. Another indicating dial shows the amount of water supplied at a given time. The meter was installed in the feed-water header at the point of discharge from the feed pumps. A large air chamber with internal baffle deflector is so placed as to prevent the pulsations of the flow of water from reciprocating pump from affecting the accuracy of the meter.

The supply of fuel oil for the boilers is held in storage tanks of 40,000 barrels capacity, the oil being brought in and delivered from tank steamers. It is distributed to the several oil-burning plants, through a special oil-handling system, consisting of two special oil-fitted duplex pumps, oil heater and inter-connecting piping, oil strainers, relief valves and oil-pressure governors.

Expert Criticises Municipal Operation.

A report on the Chicopee, Mass., municipal electric light plant has been rendered to Mayor Dunn and the Lighting Commission by C. W. Whiting, advisory manager and investigating engineer, who has been in charge of the property for a short time.

Mr. Whiting criticises the lack of system in the conduct of the plant, recommends a thorough rearrangement of lines so as to reach all parts of the city with light and power, advocates improvements in station buildings, and points out that meters are in need of testing and investigating. The street lighting should be extended and improved, also.

It is stated that meters have been read only once in two months and that while a 20 per cent discount has been given for the payment of lighting bills within 30 days, no discount has been allowed on power bills. These conditions should be harmonized, says Mr. Whiting.

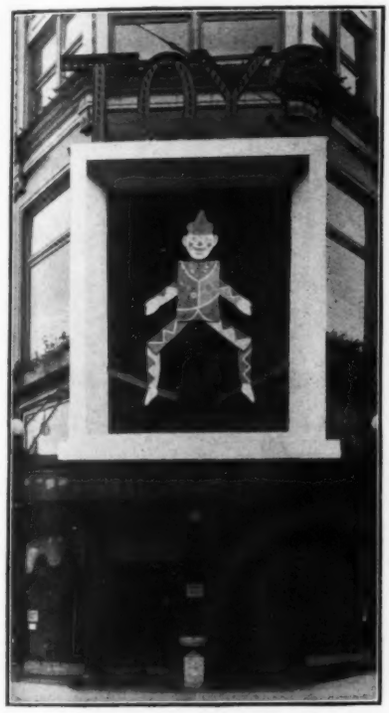
Under four months of proper management, the business has increased $7,564, and prospects for the future success of the plant are good, if business methods are employed.

The returns to the Electric Light Commission of the State show a profit on business for the year to June 30, 1915, of $7,049.38, but a real deficit arose from carrying fixed charges and other requiste accounts, of $8,503.35. The schedule for public lighting is carried at the low rate of four cents a kilowatt-hour.

Commercial Practice
Management, Rates, New Business

Seattle Sign Makes Big Impression.

What is undoubtedly the largest "Jumping Jack" in actual operation is on exhibition on the Marquise of the Standard Furniture Company's building, Seattle, Wash. The background is a framework, 16 by 18 feet, covered with black cloth set in a frame of white, which conceals 100 100-watt gas-filled lamps, which illuminate the "Toys" containing 200 5-watt 110-volt red lamps. From the attention that this novel display has attracted the store management considers the expenditure the most profitable ever made for general advertising purposes.



Jumping Jack Sign Operated and Illuminated by Electricity.

Jack at night. The Jumping Jack is made of wood painted in grotesque colors, the arms and legs being jointed, also the neck, allowing the head to oscillate to and fro in perfect time with the arms and legs. Size of the Jack is 14 feet high with a 10-foot spread of the arms. What seems to be the mysterious part of the figure is the concealed driving mechanism, which is simply a crank shaft set in bearings with a large pulley belted down to a small pulley on a coutershaft which carries another large pulley belted down to a power direct-current motor controlled by a variable-speed rheostat. On top of the framework is an electric sign 6 feet high displaying the word

Lower Rates at Fall River.

The Fall River Electric Light Company, Fall River, Mass., has recently moved into new quarters, occupying an entire building of three stories and basement. The main floor is given to demonstration of electrical appliances and the cashier's, order and complaint desks. The general offices are on the second floor, and on the third are the purchasing and billing departments and offices of the treasurer and assistant treasurer. In the basement is a storeroom and fully equipped workshop.

The Fall River Electric Light Company is a consolidation of two pioneer lighting companies, the original Fall River company and the Edison Electric Illuminating Company, both organized in 1883. Albert F. Dow, formerly president of the Edison company, is the present head of the company, having been for 32 years in continuous executive connection with the industry. Owen Durfee, the present treasurer, has had 31 years of continuous service. Arthur H. Kimball, general manager, came to the company in 1908.

Coincident with the change of quarters, the company reduced its maximum lighting rate from 10 cents to 9 cents a kilowatt-hour, discontinuing the free renewal of all incandescent lamps. The economics of Mazda units over carbon lamps are set forth in a large display advertisement in local newspapers, and in a letter sent to the customers. At present more than 75 per cent of the lighting customers are using tungsten lamps.

The company has ceased to handle the carbon lamp.

ELECTRICITY CHEAPER
Reduction in the Lighting Rate to Take Effect
MONDAY, NOV. 1
New Rate 9 cents
Old Rate 10 cents
With this Reduction In the Lighting Rate, the Free Renewals of All Incandescent Lamps Will Be Discontinued.
EDISON MAZDA
New Type MAZDA Lamp 40 Watts—40 C. P.
Old Type GEM Lamp 50 Watts—20 C. P.
A 40 C. P. MAZDA Lamp Burning 1,000 Hours Costs $3.60
A 20 C. P. GEM Lamp Burning 1,000 Hours Costs $4.50
A 40 Watt MAZDA Lamp Gives 100% More Light at 20% Less Cost Than the 50 Watt GEM Lamp.
FALL RIVER ELECTRIC LIGHT CO.
85 NORTH MAIN STREET

Advertisement of Fall River Company Announcing Rate Reduction.

The power plant at Eugenia Falls, on the Beaver River, near Owen Sound, Ontario, was placed in operation in November. It is a hydroelectric installation and operates under a head of 540 feet. The capacity is 2,400 kilowatts, divided between two units.

New Rate Schedule Adopted by New Orleans Company.

A voluntary reduction in rates for all classes of service, made possible by increased business, has been made by the New Orleans (La.) Railway & Light Company, effective December 1. The new residential and commercial lighting rate is as follows:

7 cents per kilowatt-hour for the first 20 kilowatt-hours per meter, consumed in any one month.
6 cents per kilowatt-hour for the next 30 kilowatt-hours per meter, consumed in any one month.
5 cents per kilowatt-hour for the next 150 kilowatt-hours per meter, consumed in any one month.
4 cents per kilowatt-hour for all over 200 kilowatt-hours per meter, consumed in any one month.

In addition a monthly service charge of 25 cents is made for each meter. In addition the customer guarantees a monthly consumption of not less than 7.2 kilowatt-hours per meter connected. No free lamp renewals are given.

The retail power rate comprises a charge of 6 cents per kilowatt-hour for the first 30 hours' use per month of the customer's maximum demand, and a charge of 3.5 cents per unit for all excess. The demand for any month is determined as follows:

75 per cent of installations under 10 horsepower.
65 per cent of installations from 10 horsepower to 50 horsepower.
55 per cent of installations over 50 horsepower.

The consumer guarantees a minimum monthly consumption of not less than 8.4 kilowatt-hours per horsepower or fraction thereof in rated capacity of motors connected, and in the event this amount is not consumed, the consumer agrees to pay to the company its equivalent value at the rate of 6 cents per kilowatt-hour net, no installation to be rated less than 2 horsepower per meter connected.

The wholesale power rate includes a demand charge and an energy charge in accordance with the following:

DEMAND CHARGE.

$3.00 per kilowatt of maximum demand per month for the first 5 kilowatts.
$2.50 per kilowatt of maximum demand per month for next 15 kilowatts.
$2.25 per kilowatt of maximum demand per month for next 30 kilowatts.
$2.00 per kilowatt of maximum demand per month for next 150 kilowatts.
$1.50 per kilowatt of maximum demand per month for all over 200 kilowatts.

ENERGY CHARGE.

5 cents per kilowatt-hour for the first 500 kilowatt-hours consumed per month.
3 cents per kilowatt-hour for the next 1,000 kilowatt-hours consumed per month.
2.5 cents per kilowatt-hour for the next 3,500 kilowatt-hours consumed per month.
1 cent per kilowatt-hour for the next 45,000 kilowatt-hours consumed per month.
0.75 cent per kilowatt-hour for excess over 50,000 kilowatt-hours consumed per month.

The consumer guarantees a monthly maximum demand of not less than 5 kilowatts, also a minimum monthly consumption of 153.9 kilowatt-hours and in the event the consumption does not amount to 153.9 kilowatt-hours, the consumer agrees to pay the company its equivalent value at the rate of 13 cents per kilowatt-hour net.

The New York Edison Company Adopts New School Course in Electric Appliances.

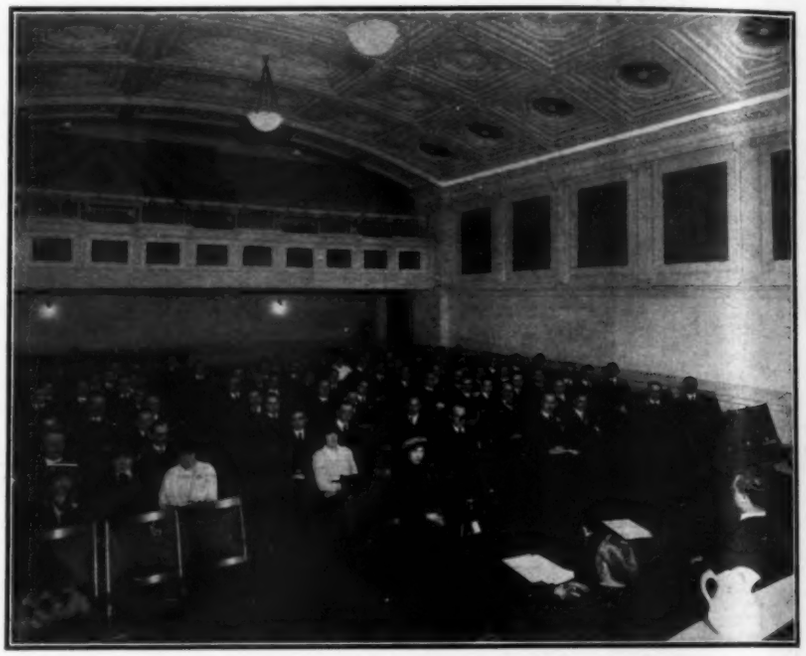
The New York Edison Company, under the direction of Arthur Williams, general commercial manager, has inaugurated a new course of 12 lectures on electric appliances in the curriculum of its commercial school. The course is specially planned for the employees of the company who come in daily contact with the public. Enrollment in the course already exceeds 100. F. C. Henderschott, manager of the company's educational bureau, explained the purpose and plans of the new course as follows:

"For several months past the companies embraced in the New York Companies' Section of the National Electric Light Association have been analyzing through committees appointed for the purpose, the present load of central stations with a view to greater development. As a result of such study it is believed that electricity for light and power purposes is universally accepted as the most convenient and in every way most desirable. The public needs little if any education along these lines. Safety is conceded, convenience admitted and the only question open to argument is that of price or rates. But there is a new field and one full of promise which as yet has been little developed—the field of electric appliances. Take for example a small consumer of light only. There are many such consumers whose accounts are unprofitable. The overhead charges are greater than is the revenue derived; but add a simple electrical appliance to the installation of these customers and such accounts then become profitable. Here is a field of development for the immediate future.

"It has been found that a campaign of education of a special kind must be carried on if this load is to be secured and actual tests have demonstrated that there are many women and men, too, who do not hesitate to detach and attach an electric lamp, but who are afraid of an electric toaster or percolator or curling iron. There are still those who believe that if they were to touch a toaster with the current turned on they would receive a shock. The superstition must be overcome."

The schedule of lectures follows:

1. December 9. "Importance of electrical appliances to the central station," by J. F. Kelly, manager of showrooms. "Salesmanship," by F. C. Henderschott, manager of educational bureau.
2. December 23. "The Showrooms," by D. T. Brown, manager of Broadway office, and F. H. Kinnicutt, manager of district offices.
3. January 6. "Domestic Heating by Electricity," by J. F. Delahant, assistant manager of showrooms.
4. January 20. "The Heating Bureau," by C. N. Lewis, manager of heating bureau.
5. February 3. "Vibrators and Small Motors," by J. Jorgensen, of the Hamilton-Beach Company.
6. February 17. "Heating Appliances," by Roger Williams, of the Simplex Electric Heating Company. "Vacuum Cleaners," by Frank Davison of the Innovation Company.
7. March 2. "Heating Appliances," by B. C. Sprague, of the General Electric Company. "Vacuum Cleaners," by W. W. Wooledge, of The Frantz-Premier Distributing Company.



New School of New York Edison Company in Session.

8. March 16. "Washing Machines and Dish Washers," by A. W. Hartigan, of The Western Electric Company.

9. March 30. "Heating Appliances," by C. W. Sears, of Landers, Frary & Clark. "Vacuum Cleaners," by A. F. Staples, of the Hoover Suction Sweeper Company.

10. April 13. "Electric Signs," by E. A. Mills, manager of sign bureau.

11. April 27. "Home Economics," by Miss A. B. Broome, manager of home economics bureau.

12. May 11. "Electricity in the Laundry," by Wallace B. Hart.

Only one examination will be required. The questions which the enrolled employee will be required to answer are:

1. (a) What is the present status of electrical appliances in developing a central-station load? Give the facts upon which you base your conclusions. (b) What are the fundamental advantages of electrical appliances in the home and in industry?

2. What is the method and what is the policy which governs the company's showrooms? Is the policy the same in the Bronx and Yonkers as in Manhattan?

3. (a) What has been the relative development and introduction of electrical heating appliances as compared to gas and other similar appliances? (b) What is the relative position as to cost, based on the rates for gas and electricity for New York City, and on utility and safety? (c) What is the company policy as to repairs and maintenance of appliances?

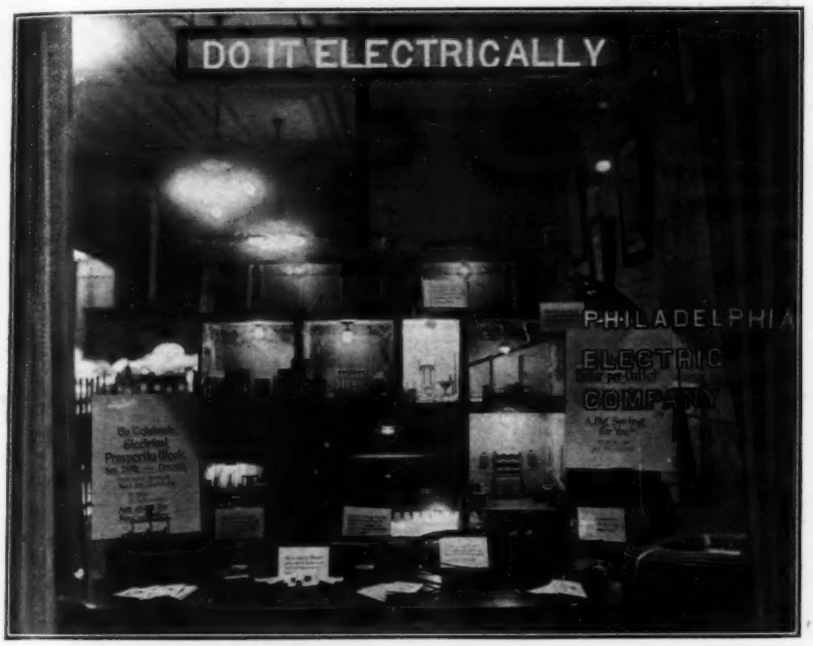
4. What is the company method and policy as to electric signs and installment installations?

5. What are the functions of the bureau of home economics?

House-Wiring Window Display Elicits 900 Inquiries in Six Days.

A sectional view of a miniature dwelling, so constructed that the various steps in wiring an already built house were graphically illustrated, formed the basis of a recent window display of the Philadelphia Electric Company that resulted in 900 inquiries being received in one week.

This miniature dwelling was about 4 feet long by 2 feet wide and 4.5 feet high. It was designed, built, wired and decorated in the Philadelphia Electric Company's shops, under the direction of the advertising department. In its construction no attempt was made to make it a specimen of architecture but all efforts were made to have in it a faithful replica of the problems met by an electrician in the wiring of old houses and the ingenious means used to solve them without undue damage. Hardwood floors, cross rafter, blind walls and tapestry wall papers are all shown together with the tools used in carrying the wires to a room without damage.



Window Display of Philadelphia Company Which Gained Business.

In this house there are six rooms and a bath, each room is furnished complete in every detail and electricity in the home is fully illustrated. On the table, in the dining room, there is a tiny chafing dish that looks most business like, while in the living room there is a tall reading lamp with a huge arm chair comfortably arranged alongside of it, a tray full of cigars in front and a general somebody-lives-here atmosphere about the whole room.

No attempt was made to minimize the facts of the case. Where in actual practice it is necessary to take up a board, it was taken up in this house; where it is necessary to open a wall, it was shown in this house; but there was a very decided effort to so clearly portray the benefits and advantages of electricity that the favorable impression was the one that stuck. That they succeeded is shown by the fact that people came inside for more information at the rate of 150 a day, every day during the week that the display was in the main office window, and that this interest continued to be shown in the several district offices to which the display was sent. The idea behind the building of this house was to back up the Electrical Prosperity Week campaign for the wiring of already-built houses and stores. To stimulate this campaign it was decided to make an offer of $1.00 per current consuming outlet on all stores and dwellings wired between the dates of November 1 and December 4. The result of this has been to turn the jobs that had been already estimated on but the people were "thinking it over" or where the estimate was more than the sum the people counted on spending.

This $1.00 per outlet campaign was given very vigorous support by all concerned. The Philadelphia Electric Company in its newspaper advertising and direct-by-mail pieces; the contractors who were furnished folders describing the offer; bulletin boards both by the Philadelphia Electric Company and some of the contractors and by the newspapers who carried a special page featuring the advertisement of the offer and the ads of contractors. That the campaign was a success is positive but more than the immediate success is the fact that the "dirtless workman" idea has been driven home in a most graphic and instructive way and that the old "Bogey" of dirt and fuss has been supplanted by the new idea of simplicity and cleanliness.

Attractive Christmas Sign for Boston Store.

A simple but effective Christmas illuminated decoration is that on the department store of W. & A. Bacon Co., Boston. It consists of a single-panel white enameled background 38 feet long, bearing the words, "A Merry Xmas to All" in white frosted four-candlepower lamps, outlined with a red and green border. There are 470 lamps in all in the sign, which is connected by festoons of greenery with an enormous bell composed of laurel leaves, high on front of the building.

The small wattage of the lamps makes the decoration an economical one to operate, and yet it is attractive and appealing to the sense. The first floor of the store is decorated with 2,300 15-watt colored lamps.

Southern California Edison Company Opens Campaign on Electric Ranges.

The Southern California Edison Company recently inaugurated a special campaign on electric ranges, the purpose of this immediate campaign being to sell ranges to residences in territory not already served with gas. An initial group of 530 ranges will, it is estimated, add a load of 210 kilowatts, replacing the noon sag in the load curve with a peak.

Plans were worked out at a meeting of the men of the commercial department at Los Angeles and presented by the general sales agent, S. M. Kennedy.

The company will do the installing of the ranges itself, practically at cost. Energy for lighting and cooking will be measured by one meter. The rate will provide for the first 40 kilowatt-hours at the present lighting rate, 7 cents per kilowatt-hour, and energy in excess thereof at 3.5 cents per kilowatt-hour, it being made an express condition, however, that the electric range be installed and used for cooking. The minimum will be $2.50 instead of $1.00 as for lighting. The average cost per connection for installing the range is estimated at $30.

Mayor Advocates More Electric Signs for Chattanooga.

Mayor Littleton, of Chattanooga, Tenn., has inaugurated a movement for the livening up of the town by means of more electric signs. At a recent meeting of the Commission, he suggested that the city set an example by placing a large illuminated sign on the City Hall. No action has been taken on this proposal as yet. To encourage the movement, he states that leniency will be shown in the construction of the fire regulations covering electric signs. At present they can extend only three feet over the sidewalk but it is stated that well-lighted signs that are not hung low will be allowed some lee-way in this respect. He also urges that signs be placed on the tops of buildings. Chattanooga does not compare with neighboring cities at night because of the lack of lighted signs, he states.

Indianapolis Bank Adopts Flood Lighting.

"Dignity" was emphasized in the electrical advertising of the banking interests of the Fletcher Savings and Trust Company of Indianapolis, when the new system of flood-lighting installed by the Merchants Heat & Light Company of that city was put into service on Sunday evening, November 28.

Looming up as a shaft of light it represents the most elaborate and dignified system of lighting beautiful buildings ever introduced in that city.

The Fletcher Savings and Trust Company Building towering to a height of fifteen stories above the street, and located on the corner of Market and Pennsylvania Streets, one of the most prominent corners in Indianapolis, offers exceptional and ideal conditions for a treatment of this kind. Built of Crotch Island granite to the fourth floor and above this of Bedford limestone, along simple Doric lines of architecture, its beauty is materially enhanced under the light playing on its smooth surfaces from the 100 projectors in use.

Night View of Indianapolis Bank Building.

The building which has a frontage of 120 feet on Market Street and 98 feet on Pennsylvania Street is 210 feet high. No attempt to flood-light it below the third floor was made, owing to an embellishment separating the granite and limestone in the architectural design. This gives a surface of 28,776 square feet on these streets which is illuminated and with the north and west exposures of 6,600 square feet constitute the area on which the light was directed.

Seventy-six projectors are used on the main exposures and twelve on each of the two smaller surfaces. These projectors were located on the roofs of surrounding buildings in batteries supported on structural-steel frames designed and installed for this purpose. The batteries illuminating the principal sides were set about 110 feet from the corner of the building and diagonally opposite, the north and west sides being covered by 12 projectors each on buildings about 50 feet away from the surface illuminated. Each unit consisted of a Bryan-March 230-watt flood-lighting lamp used in a National X-Ray projector.

The most important element, the reflector, is of mirrored glass with a new high-temperature backing developed for this service. Over the silvering there is placed a metallic surface which is then enameled.

The Merchants Heat & Light Company which is a subsidiary of the American Public Utilities Company of Grand Rapids, Mich., is exceptionally proud of this monument to the central-station industry, and expresses great satisfaction in this form of advertising lighting for buildings of this character. The bank is also very much pleased with the installation, particularly with its dignity. R. A. MacGregor is sales manager of the company.

Electrical Construction

NOTES ON INTERIOR WIRING.[1]

By Terrell Croft.

Switch and Cutout Suggestions.

Switches and fuses should, in general, control and protect all of the wires of the circuit which feeds through them. The reason for this will be evident from a consideration of Fig. 1. Consider branch circuit *A*, which is fed from the mains through a single-pole switch *D* and fuse *E*. If an accidental ground occur at *B*, and another ground exist simultaneously at *C*, a short-circuit would result, as shown by the dotted arrows, even though the single-pole switch *D* were open. It is also obvious that even if *D* were closed the fuse *E* would not "blow" and open the branch circuit under the short-circuit conditions just outlined. Furthermore, if there were an accidental ground at *F* on another branch circuit *K* (which is protected with a fuse in only one wire) then the incandescent lamps on branch *K* would be illuminated regardless whether switch *D'* was open or closed. This supposes ground *B* to exist, but ground *C* removed. Now, if a branch circuit is controlled with a fuse in each wire and a switch blade in each wire as shown at *G*, then the undesirable and dangerous conditions outlined above cannot occur. In practice it is not feasible or desirable to fuse and switch all of the wires of all circuits. The conditions under which such fusing and switching is not desirable nor required are noted in the following paragraphs.

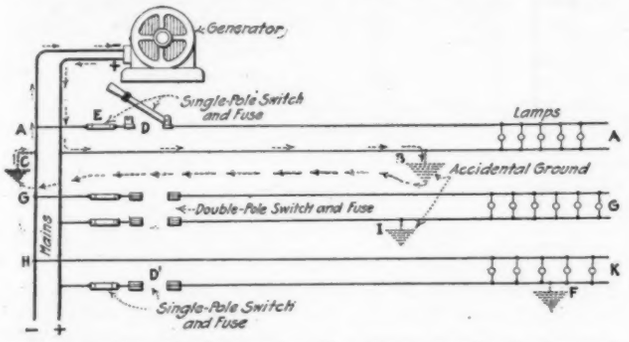


Fig. 1.—Showing Why All Wires of a Circuit Should Be Provided With Fuses and Switches.

The exceptions to Rule 19*a* of the National Electrical Code requiring a switch and fuse in every wire, are as follows:

(1) Rule 8*c* permits small motors of one-fourth horsepower or less capacity on circuits with voltages not exceeding 300 to be controlled with single-pole switches where the installation is not in damp places.

(2) Rule 25*a* specifies that heaters of 6 amperes or 660 watts capacity or less may be grouped under the protection of a single set of fuses, provided the capacity of the fuses does not exceed 10 amperes.

(3) Rule 43*c* specifies that it is not necessary to have a cutout and switch for each motor of an electric crane, where the crane does not have a cab.

(4) Rule 23*a* specifies that the fuse must be omitted from any permanently grounded service wire.

(5) Rule 23*b* specifies that the fuse must be omitted in any permanently grounded wire except where a two-wire branch circuit is derived from a three-wire system.

A fused two-pole knife switch is shown in Fig. 2. This switch is fused at the handle end and the fuse-clips on it are of the type required to accommodate National Electrical Code standard fuses of capacities of from 0 to 60 amperes. That is, they are of the ferrule-contact type. The metal parts of the switch shown are stampings, pieces formed from strap metal or screw-machine parts.

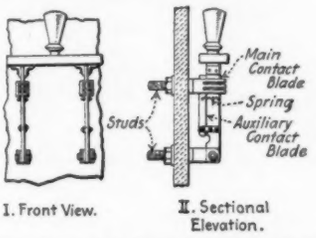


Fig. 4.—Quick-Break Knife Switch.

A three-pole knife switch fused at the hinge end is shown in Fig. 3. Switches of this type are used for controlling three-wire or three-phase circuits. The fuse contacts are of the type required for National Code standard fuses with capacities of 61 to 600 amperes and are known as the knife-blade contact type. The standard dimensions of these contacts are given in Code Rule 68. The switch is shown in the illustration mounted on porcelain knobs, which construction is frequently adopted for wiring installations in damp places, to maintain the switch as dry as possible.

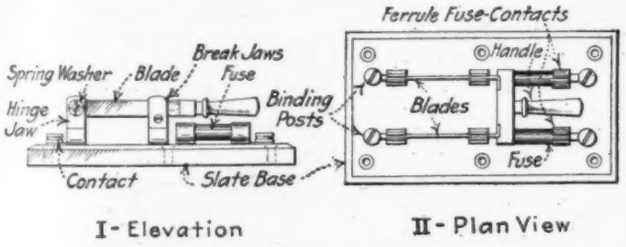


Fig. 2.—Double-Pole Front-Connected Knife Switch Fused at Handle End.

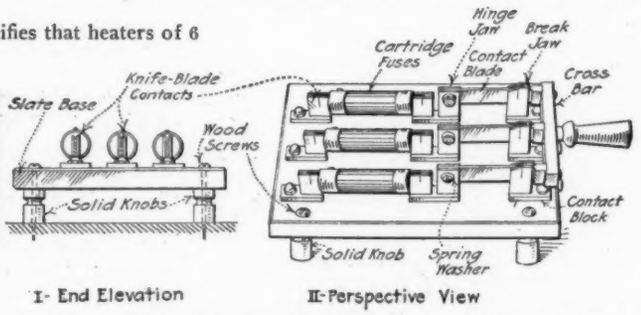


Fig. 3.—Three-Pole Rear-Connected Knife Switch Fused on the Hinge End.

[1] All rights reserved. Reprint forbidden.

A quick-break knife switch is shown in Fig. 4. Where a knife switch of the type shown in Figs. 2 and 3 is opened under load there is always a tendency for an arc to form between the blades of the switch and the contact jaws. If the switch is opened slowly, these arcs may burn away the metal of the blades and contacts. This would ultimately cause a poor connection. With a quick-break switch, an arc is not readily formed. The reason is that when the main blade is opened slowly the auxiliary blade is held between the jaws by friction until the main blade has been almost wholly opened. Then the spring will pull the auxiliary blade out so abruptly and rapidly that an arc will not persist.

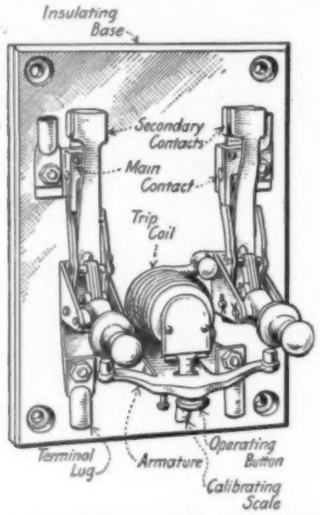


Fig. 5.—200-Ampere, 250-Volt Double-Pole Circuit-Breaker.

Circuit-breakers should be so arranged that no one pole can be opened without opening all of them. Fig. 5 illustrates the meaning of this requirement. For example, to open a circuit-breaker like that shown, one must press upon the operating button. This disengages the trips restraining *both* of the arms of the breaker, which permits them to open, thus disconnecting both wires of the circuit. Fig. 7 illustrates the construction of a large-capacity circuit-breaker. No solenoid is necessary for the trip coil of this breaker. The heavy current, for which it is designed, in passing through the lower copper terminal stud to the laminated copper brush creates a sufficiently strong magnetic field in the iron U-shaped yoke, which is mounted over the terminal stud, to trip the iron armature. When the iron armature is drawn up, the breaker opens. The different methods of mechanically interconnecting the arms and electrically interconnecting the trip coils of circuit-breakers so that they will afford complete protection for the circuits with which they are associated are so numerous, that it is not feasible to consider them in this brief article.

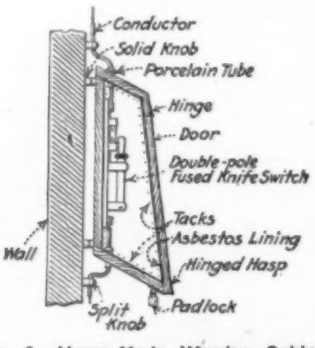


Fig. 6.—Home-Made Wooden Cabinet.

A single-pole circuit-breaker provides ample protection for a grounded street-railway circuit. It is obvious that, since the return conductor is grounded, nothing would be gained, insofar as overload protection is concerned, if an additional breaker were inserted in the ground lead. One side—usually the negative—of every street-railway circuit is then permanently grounded. Double-pole overload protection, is, as outlined in connection with Fig. 1, useful chiefly to protect against accidents which may occur due to grounds on a circuit all wires of which are normally free from ground connections.

Cutouts and switches in dirty places or where subject to mechanical injury should be protected by suitable cabinets. It is obvious that electrical fittings should be protected from mechanical injury, not only because of the defacement that may be caused thereby but also because such injury may result in short-circuits or grounds which may originate fires. Furthermore, switches and fuses in dusty, dirty, or linty places should be inclosed so that the arcs that may form when fuses melt will not ignite the finely divided material in the surrounding atmosphere. Fig. 6 illustrates a type of construction of a wooden switch and cutout cabinet which is suitable for use in connection with knob-and-tube or cleat work.

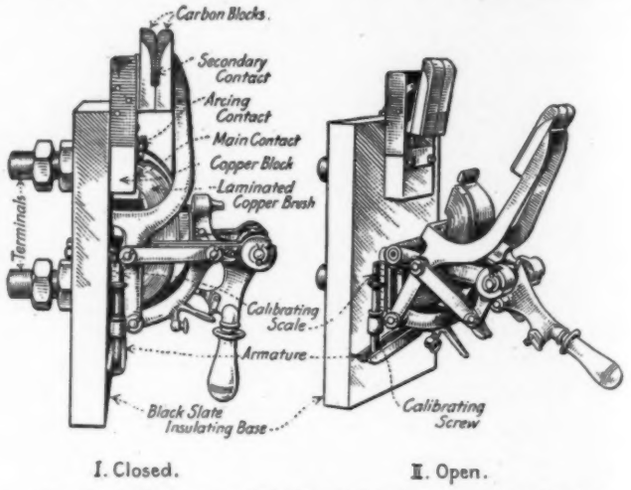


Fig. 7.—2,000-Ampere, 650-Volt Single-Pole Overload Circuit-Breaker.

The top and the bottom of the box are pitched so that they will not collect dirt and dust and the door is hung at an angle with the vertical, so that it will tend to always remain closed. Conductors where they enter and leave the box pass through porcelain-tube bushings. The back of the box is held away from the wall, leaving a free air space by mounting it on porcelain knobs. This insures that the box will remain dry, even if the wall becomes moist from rain beating against its outside surface.

Metal cabinet and cutout boxes should be used with flexible or solid conduit and metal-molding systems to insure the electrical interconnection of the conduit and the metal-molding systems. All components of switch systems should be interconnected and thoroughly grounded as specified in the Code rules. Fig. 8 shows a typical, metallic switch-and-cutout cabinet which satisfies these requirements. Metallic cabinets should be used even for knob-and-tube or open-work installations where the liability to mechanical injury is considerable. That is, steel cabinets should be used where they are located in exposed places in industrial plants and mills.

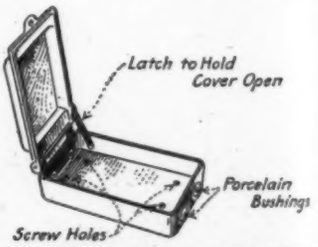


Fig. 8.—Metal Box for Inclosing Switches or Cutouts.

Oil switches usually have dustproof cases, as shown in Fig. 9. The illustration, although it shows a small-capacity oil switch, indicates construction that is fairly typical of all oil switches and circuit-breakers. The welded steel tank con-

tains the oil and is designed to hang from the top casting. It is held thereto by supporting bolts with which the tank can be drawn tightly up against the leather gasket glued to the lower face of the top casting. Dust and dirt are thus effectively excluded.

Approved metal cabinets should be used in damp places to protect switches and cutouts. The reason for this is that wood, even if it is thoroughly impregnated with some waterproof compound, is liable where exposed to continued moisture to become saturated and thereby become a reasonably good conductor. It is apparent then, that cabinets of metal, which is of course a conductor, are, insofar as insulation is concerned, about as good as wood. The metal cabinets have the further advantage that they are fireproof and that they will not warp out of shape and that the screws holding the cutouts and switches to them will not loosen. The doors of metal cabinets can be so made that they will close tightly, thereby tending to exclude moisture. They do not warp and bind as wooden ones are liable to do.

Sign flashers, time switches and similar appliances should always be mounted in cabinets, because they are liable to become disarranged and originate excessive arcs. In most of these devices there is some rotating part which frequently carries current and which is liable, if a screw comes loose, or in case of other accident, to engage with some other metal part of opposite polarity and thereby make trouble. Furthermore, in these devices when they are operating, there is nearly always a drum which is rotating and which pulls arcs at the different contactors several or many times each revolution. Such arcs, may, unless the apparatus is properly inclosed, create fires or explosions under certain conditions.

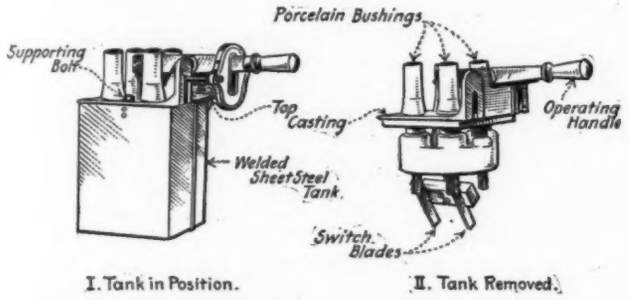


Fig. 9.—Dustproof Inclosure for Oil-Switch Mechanism.

Among the Contractors.

Buchanan-Boughton Company, of Marshalltown, Iowa, is wiring the new Strand Theater in that city. This is a modern electrical conduit job throughout, including two 30-inch ventilating fans; electric fountain in the lobby; a large electric sign with a fountain on the same; and a large illuminated canopy over the front walk.

THE INSTALLATION AND WORKING OF LEAD STORAGE BATTERIES.[1]

By R. Rankin.

In the choice of a storage battery, the most important point is to get it large enough, and the next point in importance is to get the charging plant of sufficient size to thoroughly and properly charge the whole battery. Certain auxiliary apparatus must be provided: a cell-testing voltmeter, a hand lamp, hydrometers and a hardwood or ebonite lath for clearing accidental short-circuits between plates. Without those requisites, it is quite unfair to expect any battery attendant to get satisfaction from the cells under his care. A further essential is means for charging, individually, cells which may get a little lower in condition than the body of the battery. Where cells are bolted together, a short bridging lead, consisting of a piece of cable with two suitable terminals, serves this purpose. The weak cell is disconnected from the circuit, and continuity obtained by connecting the cells adjacent to it by this lead. Where cells are of the burnt-up type, in which the plates are welded to connecting channel-bars, a small set called a milking booster, or "milker," is required. The generator of this set is connected to the positive and negative terminals of the "sick" cell, and a current passed so as to charge it.

When the bridging lead is used, the "sick" cell is taken out of circuit during the discharge and re-inserted on charge, this operation being repeated as often as is necessary to bring the cell into line with the others. On the other hand, a milking booster can be connected to a cell either on charge or discharge. On discharge, it is used to lessen the discharge current taken from the cell. It is essential to obtain a milking booster capable of giving at least the normal charging current specified by the makers of the cells.

A battery of suitable size having been decided upon, the erection and first charge next occupy the engineer's attention. The latter is a very important matter. The best plan is to ensure that the generating plant will be erected and tested before any attempt is made to fill up the cells. When it is reasonably certain that the generating set will run through without trouble, the cells should be filled with acid as quickly as possible. Immediately filling up is complete, the battery should be put on charge. The acid, usually, has an initial specific gravity of about 1,200 at normal temperature.

The usual rate for first charge is about two-thirds of the normal charge rate, which is, in general, roughly equal to the seven-hour discharge rate. The charge, once started, should be continuous, if possible, and the current should be kept steady, unless the temperature of the cells becomes too high. The temperature should not rise above 100 degrees Fahrenheit, and if it shows signs of approaching this figure, the charging current should be reduced so as to keep the temperature below the permissible maximum.

For the first few hours, the specific gravity of the electrolyte falls, reaching a value from which it begins to increase. This increase continues until the whole of the sulphate in the cells is reduced. The cell voltage increases until a maximum is reached, when the cells are fully charged. The only reliable indication that the cells are quite fully charged is constancy of voltage and specific gravity, and the first charge should not be considered complete until there is no increase in either for a period of about six hours. A temperature correction may have to be applied to the specific gravity.

The time required for the voltage and specific gravity to reach constancy depends on the state of the active materials on the plates, and may be anything from 40 to 60 hours.

The first charge being finished, the battery may be put into commission immediately, but it will usually be found necessary to adjust the specific gravity and level of the electrolyte in all the cells. At first the working should not be too heavy, and a generous amount of excess charge should be given after each discharge. This is mainly on account of the positive plates, and tends to adjust inequalities among them, and get the active material into a state suited to the condition of working.

The battery being in active service, it remains for certain elementary facts to be recognized, and steps taken to insure that a few simple, yet indispensable rules, be followed.

The elementary facts are:

1. A battery is not to be looked on as a generator.

2. The capacity of a battery varies with the rate of discharge.

[1] Portion of paper presented to Association of Supervising Electricians, London.

3. The permissible minimum final voltage of a battery varies with the rate of discharge.

4. Switchboard and other instruments may be, and probably are, inaccurate.

5. Sick cells must be nursed.

The simple, but indispensable, instructions are:

1. Do not discharge beyond the limits specified by the makers.

2. Do not leave the battery in a discharged condition longer than is unavoidable.

3. Make sure that every charge is a full one.

4. Unless for special reasons, charge only at the normal specified rate.

5. Do not predetermine the charge to be any definite percentage in excess of the discharge.

6. Attend to defective cells at once.

7. Check, periodically, the accuracy of instruments.

8. Keep the level of the electrolyte above the tops of the plates by the addition of pure water only.

The facts or axioms concerning batteries which have been enumerated may be dealt with as follows:

(1) It must not be assumed that an engineer can put his battery on load at any time, and at any current it will carry, unless it is at the time in a fit condition. What a battery can do at any time depends on what it has already done at that time.

If it is intended to use a battery at unexpected or irregular times, steps must be taken to have it, as far as possible, always ready in a charged condition. If this is arranged, even a small battery will deal with emergencies which would very much overtax a generator of the same normal rating, the overload capacity of a battery in current being enormously high.

(2) and (3) Approximate relative capacities, and the corresponding currents and final voltages of a cell at different ratings, are given in the following table. If discharge is invariably continued to some definite voltage, irrespective of the rate, overdischarge may result.

Duration of Discharge in Hours.	Capacity in terms of Maximum.	Rate of Discharge in terms of 10-hour Rate.	Minimum Final Volts.
10	1.00	1.00	1.83
9	0.98	1.09	1.83
8	0.95	1.19	1.83
7	0.92	1.31	1.83
6	0.88	1.46	1.83
5	0.83	1.67	1.83
4	0.78	1.95	1.80
3	0.72	2.39	1.80
2	0.63	3.17	1.78
1	0.50	5.00	1.75
0.75	0.45	5.84	1.70
0.5	0.37	7.45	1.70
0.25	0.22	8.95	1.70
Peak		12.50	1.60

(4) If discharge is always continued until a definite total voltage is reached, and if the switchboard voltmeter is reading high, the battery may be over-discharged on every discharge, and the effect will be disastrous. Cells slightly lower in capacity than those in the body of the battery will get into bad condition, and will never get a chance to pull round again.

(5) If low or sick cells are not attended to at once, each discharge will bring them into worse condition, and if the trouble is not attended to and removed the cells may be ruined. It may be observed that the amount by which they are out of line with or lower than the others, need only be small to give trouble of this sort a beginning. Where cells are properly charged, however, the usual excess charge is sufficient to level up small inequalities in the condition of the cells, but if a few of the cells are allowed to get very low in condition, and the battery as a whole, therefore, seems low in capacity, nothing but harm can result from overcharging the whole battery on their account.

In dealing with the indispensable instructions to be followed, it will probably be best to take them up individually, and discuss the effects of neglect of, or non-compliance with them.

(1) Transgression of this means over-discharge and excessive sulphation. If a battery is over-discharged, more than the normal amount of overcharge is required to bring the cells fully up. Sulphate, on a positive plate, occupies a different volume from that occupied by the active peroxide material. On Planté positives, the active material being in the form of a skin on the grid, this variation in volume sets up stresses in the plates, and leads to buckling. In buckling, some parts of the positives get closer to the negative plates than others, and thus are overworked; this, if heavy working is continued, augments the buckling tendency, and the final result is short-circuiting, and, in due course, ruination. The point to be observed in all this, is that the trouble is cumulative.

(2) A battery in a discharged condition is just in the state in which it is most liable to the formation of sulphate and, naturally, the longer it is left thus, the more danger there is.

(3) If the charge is not full, some of the active material farthest from the surface remains in a sulphated condition, and this sulphate may develop into the stubborn variety.

(4) The normal rate is that which the makers have found by experience to be the most efficient and the most suitable for their plates.

It is a fact, little realized, that a cell cannot be properly charged at very low rates. The negative plates will be charged, but if the charging current is below a certain value, it simply sulphates the positives instead of charging them. Charging at high rates is bad for several reasons. For one thing, it is inefficient. Diffusion of the electrolyte in the pores of the active material, cannot keep pace with the reduction of the sulphate on the more accessible parts of the material, and part of the effect of the current is wasted in gassing.

Gassing has the effect of loosening the active material on the positives and causing a heavy deposit, and thus a reduction in capacity.

Excessive charging rate also means spraying, and heavy loss of electrolyte. The results of this are lowering of the insulation resistance, possibly electrolytic troubles, and rotting of the wooden stands and containers, if those are of the lead-lined wood type.

(5) Charging a battery in such a way that the ampere-hours put in on charge always exceed those taken out on discharge by a definite percentage, is one of the most fruitful sources of battery trouble.

It is a very common notion that the charge in ampere-hours should be 10 per cent greater than the discharge. It is easy to show that not only is this figure wrong, but that the idea underlying it is wrong.

If a cell is allowed to get badly sulphated, it will gas furiously long before it is fully charged. In fact, attendants who like to see a cell "milky" may have their heart's desire in a cell so badly sulphated as to be almost ruined, and, what is worse, a high voltage accompanies this "milking," making it doubly misleading. In such a cell, continuance of the charge will reduce the "milking" and the voltage, contrary to what happens in a cell in normal healthy condition.

(7) The necessity for checking the accuracy of instruments on which the welfare of the battery depends will be obvious.

(8) If the level of the electrolyte falls below the tops of the plates there is, consequently, less active plate area available. The result is a reduction in available capacity, and if the full rated number of ampere-hours is taken out, the part of the plate in actual use is over-discharged which is conducive to over-sulphation.

Another effect of low electrolytic level is that it gives rise to corrosion on the positive plates. Corrosion, when experienced, usually occurs at the surface of the electrolyte, if it gets a start. It is assisted by the fact that the specific gravity of the electrolyte is lowest at the tops of the containers, for corrosion proceeds most rapidly in weak electrolyte.

To diminish this tendency and the tendency for the heavy acid to settle at the bottom of the containers, it is best to add water by means of a glass funnel and tube, so that it reaches the bottoms of the cells first.

Public Service Commissions

Conducted by William J. Norton

ARIZONA.

The Prescott Gas & Electric Company was ordered to file by January 1 a detailed inventory of its property used and useful.

The Southside Gas & Electric Company. The application of the company for a rehearing of the rate case, reported in ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, October 23, 1915, was denied by the Commission.

CALIFORNIA.

Great Western Power Company of California. A plan for the financing of the Great Western Power Company of California, a corporation recently formed by the merger of eleven light and power companies, has been submitted to the Railroad Commission for approval.

The Anuual Report of the Commission for the year ending June 30, 1915, has been compiled and transmitted to the governor.

The Pacific Gas and Electric Company. The Commission denied the company's application for a rehearing of the complaint of the city of San Jose against the company.

The Great Western Power Company was authorized to issue $1,400 par value of common capital stock at not less than par to pay organization expenses.

DISTRICT OF COLUMBIA.

Monthly Reports. The Commission has adopted a form for monthly reports of all electric companies operating in the District, which will show the number of customers supplied under each of the schedules in effect, and the amount of energy consumed and the revenues obtained under each schedule.

The companies are ordered to keep, after January 1, 1916, such records as are necessary to the compilation of the required data for each fiscal month.

Filing of Annual Reports. The Public Utilities Commission has sent to Congress the draft of a bill providing for 30 days' extension of the time allowed public service concerns to file their annual reports.

Paragraph 14 of the Public Utilities law provides that the accounts of the public utilities shall be closed annually on December 31, and a balance sheet taken therefrom, and, together with such other information as the Commission shall prescribe, filed with the Commission on or before February 1.

If amended, as proposed, the law will allow the utilities until March 1 to file their annual reports. Experience has demonstrated, the Commission states, that the time allowed under the existing law is too short to permit the utilities to close books and prepare the necessary data.

Rules of Procedure. On December 1, 1915, the Commission adopted rules to govern its proceedings and to prescribe the manner of conducting its investigations and hearings.

INDIANA.

Rochester Electric Light and Power Company. The Commission has authorized the Rochester Company to file a new schedule reducing certain of its rates for electric service. The new residence lighting rates are 10 cents for the first 50 kilowatt-hours and 5 cents for all excess, with a 50-cent monthly minimum charge. The rates for cooking service are: 10 cents for the first ten kilowatt-hours and 2.5 cents for all excess.

The Akron Light, Heat and Power Company has surrendered its franchise and received an indeterminate permit from the Commission.

The Citizens' New Telephone Company, of Ellettsville, was authorized by the Commission to increase its rates to the following schedule: For stone quarries, individual lines, $2.50 a month; for business telephones, individual lines, $1.50 a month; for private residences, individual lines, $1.25 a month. A charge of 25 cents a month additional is prescribed for such lines as have connection with the Bloomington (Ind.) system.

KANSAS.

Kansas Natural Gas Company. The Commission has rendered a decision practically reaffirming its former order handed down last July, and finding that an increase to the 28-cent rate is reasonable. The Commission also recommends that the affairs of the receivership be wound up promptly and the property turned over to the owners.

NEW HAMPSHIRE.

Annual Report. The report of the Commission for 1914, Vol. IV, contains the annual reports of the various railroad corporations and public utilities under jurisdiction of the Commission for the year ended June 30, 1914, and a summary of the Commission's work for the two years ended August 31, 1914.

NEW YORK—First District.

Oscar S. Straus was appointed by Governor Whitney to fill out the unexpired term of Edward E. McCall, who was removed from office December 7, following the investigation of his record on the Commission by the Thompson Legislative Committee. Mr. Straus will take office about December 20 as chairman of the Commission. Commissioner Cram, the senior commissioner in point of service, was elected temporary chairman for the interim.

Commission Procedure. On motion of Commissioner William Hayward, hearings before the Public Service Commission for the First District hereafter, instead of being assigned to individual commissioners, will be set down for hearing before the whole Commission.

Reports of Decisions. The First District Commission has issued Vol. V. of its Reports in bound form. The report contains determinations of the Commission passed upon by the court amendments to the Public Service Commissions Law enacted in 1914, and decisions of the Commission for the calendar year of 1914. A Documentary History of Railroad Companies is issued as Part 5 of the annual report of the First District Commission for the year 1913. The Commission required all companies under its jurisdiction to file all documents relative to their incorporation, franchise rights and intercorporate relations. About 7,000 of these documents are now on file. From the data thus collected, the Commission has compiled a summary of the essential data relating to railroad companies.

Second District.

The Montgomery County Electric Light and Power Company was authorized to extend its lines into the towns of Sharon and Cherry Valley and the village of Cherry Valley, with the purchase and dissolution of the Cherry Valley Gas Company, which is at present supplying the village of

Cherry Valley with acetylene gas, is provided for in orders of the Commission recently handed down.

The franchises from the town authorities are approved and an issue of $15,000 of the common stock of the company is authorized to be sold at par, the proceeds to be used in the new extension.

The Municipal Gas Company of Albany has had in effect a minimum charge of $9.00 per year. In cases where less than nine dollars' worth of current has been used in the last year, the company experienced some difficulty in collecting bills presented for the balance due under the minimum charge provision. The Commission has issued an order which it is hoped will do away with the confusion. In any month in which a customer's bill for current is less than 75 cents the company is permitted to send a bill for this monthly minimum under the rates provided. If at the end of the year the company has collected more than $9.00 and the customer has not used nine dollars' worth of current, the company will refund the difference between the amount collected and the nine-dollar minimum.

WASHINGTON.

Puget Sound Railway and Light Company. The Commission ordered a reduction in the lighting rates for the City of Everett. The value of the properties of the Puget Sound Railway and Light Company is found to be $2,170,592.58, and the value of the light and power department is fixed at $469,465.48. The Commission estimated that the company's net profit in 1914 was 15.81 per cent. A reduction was ordered, which with the same number of consumers, will give the company a return of 8 per cent.

WISCONSIN.

The Superior Rural Telephone Company, operating as a mutual company, refused to extend service to an applicant for service unless he would become a subscriber to the company's stock. The complaint filed with the Commission raises the question as to whether or not the company can compel an applicant for service to become a stockholder in the company.

The decision says: "The Commission has never issued a formal ruling on this question, but has informally expressed the opinion in correspondence that such a requirement is not a reasonable one. A mutual telephone company which serves its own stockholders exclusively may nevertheless be a public utility within the meaning of the public utility law. For example, if a mutual company should number among its stockholders all except one or two of the inhabitants of an isolated valley, and should refuse to serve such nonstockholders, they would not be able to secure service from any source unless the mutual company could be compelled to extend its service to them. No outside telephone utility could be required to enter such a field for the service of one or two patrons. Whenever a mutual telephone company is so located in a community that residents cannot secure any reasonable telephone service except through it, the business is of a public nature and the mutual company is a public utility." . . .

This is found to be the situation in the present case.

"A public utility is required by law to render adequate service at reasonable rates. A customer may be charged a rate sufficient to provide a reasonable return for the utility, but he cannot be required to share in the undertaking. The ownership of stock in this company makes a person liable to assessment if the revenue is insufficient or if unforeseen contingencies arise, and entitles him to share in any profits of the enterprise. The assumption of the responsibilities of a stockholder, however, is purely optional with the consumer, and cannot be forced upon him as a condition procedent to receiving service."

The company is ordered to extend service to the complainant and to desist from its practice of requiring applicants for service to purchase stock in the company.

Reasons for Electrical Progress.

C. P. Sparks, president of the (British) Institution of Electrical Engineers, in his inaugural address delivered in London in November summarized the hampering effect of past legislation upon electricity supply business in England, and referred to the initial mistakes as to supply areas which had resulted in the want of coordination and uniformity that characterize the supply systems of the London district. Owing to those difficulties it is still impossible for the subject of London's supply as a whole to be considered from an engineering point of view. The president devoted one section of his address to an account of the various inventions, developments and main engineering features that had in spite of the above handicap resulted in improving the reliability of supply and in greater economy of production. Later Mr. Sparks gave four main reasons why we should expect a large further expansion in general electric supply apart from electric traction and electro-chemistry, as follows: (1) Necessity for fuel economy; (2) The extension of lighting; (3) The increased range of transmission; and (4) Domestic use of electricity. He said in part as follows on these points:

(1) *Necessity for Fuel Economy.*—The economical use of fuel has been hindered in this country by its low price. Only a fraction of the total coal consumed is at present used for centralized source of supply of power and heat; the principal future economy in fuel is to be found in increasing the use of such centralized supply to allow the most efficient use to be made of the world's coal supplies. To attain this economy, large capital outlay is required on plant for converting the heat energy of the coal into electricity, but the present apparent lower cost using fuel inefficiently at a large number of isolated points retards progress in the direction of centralization, as immediate results are often only considered.

The fuel-saving by using a centralized supply is due to the reduction of standby losses and to the higher efficiency of large generators and boiler plant when worked under skilled supervision. The fuel-saving under average conditions from a central scheme as compared with isolated plants is not less than 75 per cent. With the gradual increase in the cost of fuel, it is unquestionable that all main supplies for power and heat will be obtained in the future from centralized sources.

One of the next steps to lower the cost of production of electricity will be the gas-firing of boilers, the gas being obtained from producers worked at a low temperature. This will provide by-products from the distillation of the coal as a raw material for other industries. The sizes and positions of most of the present power stations prevent this system being used, as by-product processes can only be successfully worked on a large scale and with plant operating at a high load-factor; but the increase of electrical energy taken from centralized sources of supply and the gradual change from comparatively small stations to main power stations, will allow of this method of generation.

(2) *The Extension of Lighting.*—Apart from hygienic reasons, it is certain that electricity will prevail more and more as an illuminant owing to the greater number of candlepower-hours that can be obtained from a ton of coal by using electricity as compared with gas. With electricity generated in modern power houses using 25 British thermal units per watt-hour, and with 85 per cent efficiency of distribution the number of candlepower-hours obtained per ton of coal is, with metal-filament lamps of 15 to 20 candlepower no less than 750,000, as compared with 260,000 in the case of gas, gas mantles of 20 candlepower and 13,000 cubic feet of gas per ton of coal carbonized being assumed. The amount of coal required with electricity for small units of light is thus only one-third of that necessary for an equal illumination with gas.

It may be suggested that further im-

provements in the gas mantle will equalize matters; but it must be remembered that electricity is more than holding its own in new developments. The half-watt lamps now on sale have again reduced the energy per candlepower-hour by more than 50 per cent for lamps of 120 candlepower (smaller units of light being available when lower pressures than 100 volts can be obtained by transformation).

(3) *Increased Range of Transmission.*—Further research should result in improved dielectrics which would allow higher working pressures for underground cables, thus lowering the cost of transmission, increasing the size of each centralized undertaking, and again raising the operating load-factor by the greater diversity in the demand.

Pending this development, the economical radius of transmission can be increased by using overhead lines outside the thickly populated districts, and it is not too much to expect legislative action in the national, as against private, interests. Statutory powers should allow the erection of transmission lines along the most economical routes, reasonable rents for wayleaves being fixed by an independent tribunal.

(4) *Domestic Uses of Electricity.*—There is no section of the general supply that opens up greater possibilities than electric cooking and heating, since at a low estimate the units required for these purposes would be ten times those required for lighting. This development would utilize to much greater advantage the distributing mains in residential areas, which are at present only fully loaded during a few hours per annum. An improved load-factor would lessen the cost of suplying energy.

While the efficiency of conversion in the present electrical apparatus is high, and the system is an ideal one hygienically since there are no products of combustion, development has been slow for the following reasons:

(*a*) With the present method of conversion of the heat energy in the coal to electricity it is only possible to deliver to consumers some 15 per cent of the heat energy in the coal.

(*b*) The present cost of the apparatus and its maintenance. A large expansion of business would enable manufacturers to meet this point, and immediate improvement will take place as soon as the supply undertakings are prepared to let on hire and maintain apparatus on liberal terms in the same manner as the electric motor business was developed.

(*c*) The rates charged for this class of supply are in many cases not sufficiently low to encourage development. A low rate is essential and is justified by the high diversity-factor and the large number of hours of use, resulting in a greatly improved load-factor from the residential demand.

ELECTRIC-MOTOR CONTROL.

Monthly Meeting of the American Institute of Electrical Engineers.

The 316th meeting of the American Institute of Electrical Engineers was held in New York City on the evening of December 10. President J. J. Carty occupied the chair. A paper was presented by C. D. Knight entitled "The Principles and Systems of Electric Motor Control."

This paper pointed out the important place which the electric motor has attained in industrial activities, due largely to ease of control. The different types of resistor were described and their temperature characteristics shown by diagrams. Manual control was considered satisfactory until a few years ago, but for large motors and frequent reversals has now been largely superseded by automatic contactors. The different methods of applying these were discussed. The essential parts of a contactor are contacts, blow-out, magnet, frame and pivot bearings. These were considered in turn. Solid copper contacts are preferable to carbon or laminated copper. Direct-current shunt contactors, series contactors, and alternating-current contactors were then considered. Methods of control are by counter electromotive force, current-limit relays, or series contactors for direct-current motors; for squirrel-cage motors the voltage is reduced by resistor or autotransformer; for slip-ring motors current-limiting relays are usually used. Time-limit devices may be used for either direct or alternating current. Dynamic braking was also briefly considered.

The paper was discussed by Bassett Jones, Edwin J. Murphy, W. I. Slichter, F. B. Crocker, J. H. Albrecht, H. F. Stratton, M. D. Goodman, Selby Haar and F. W. Gay.

Mr. Jones referred to the trouble which inexperienced men meet in getting appropriate control apparatus for motors.

Mr. Murphy referred to railway work and steel mill drive, where manual control became impossible, as introducing automatic control. He advocated copper in preference to carbon contacts, and air-break in preference to oil-immersed contactors. A serious limitation to the counter-electromotive-force system of control is that a drop in voltage may cause the last contactor to fail to close. Time-limit devices are suitable where a definite load is handled, but for general purposes a current-limiting device is preferable. For fire-pump work the time-limit method was recommended.

Professor Slichter questioned whether all the regulating and protective devices usually included in control systems are so essential that they warrant the complexity introduced, and whether a uniform system of conventional symbols might not be used to advantage. Complexity may be reduced by the method using series relays. The use of contactors energized by alternating currents meets difficulties owing to the liability of chattering with pulsating flux, and because at constant voltage the current required to produce the flux is large when the contactor is open but small when it is closed. In both dynamic braking and "plugging" heat is generated in the armature, which must therefore be of larger capacity than if these methods were not used.

Professor Crocker gave reminiscences comparing the state of the art today and 25 years ago.

Mr. Albrecht advocated the use of graphite for the initial contactor to prevent "freezing" or sticking of the contacts with large currents when jogging results from quick manipulation. The final contact is made with copper. He favored air-break switches for high alternating voltages, as they are easily inspected and have other advantages. He did not favor either mechanical or electrical interlocking; a drop-out relay is preferable. He referred to a rolling-mill set of the Bethlehem Steel Company, consisting of a 12,000-horsepower direct-current motor supplied from a flywheel motor-generator set running on alternating current. The motor of this set has a capacity of 2,000 horsepower. The mill motor is permanently connected to the generator, and is controlled by the generator field and motor field, the speed varying from 0 to 120 revolutions per minute. This method avoids large losses of energy in rheostats, and provides for regeneration when the load goes off entirely, this energy speeding up the flywheel.

Mr. Stratton emphasized the reasons for the constantly increasing use of electric power. Modern manufacturing is characterized by increased wages per hour, decreasing wages per unit of output and increasing investment for equipment. Operations must be planned and regulated as to speed, feed, etc., so as to keep the output up to the capacity of the machine. This is where electric control excels, and its proper development is along lines of increasing production and decreasing labor cost.

Mr. Goodman advocated copper contacts. Carbon is not satisfactory where there are thousands of operations per day. To overcome rebound a loose plug may be inserted in the main contact arm, thus avoiding arc-

ing. He referred to an inverse-time-element overload relay which can be used for all classes of service.

In closing Mr. Knight explained how the motion of the contactor prevents freezing and would not admit that carbon or graphite would wear as long as copper. He agreed that the electrical interlock might be dangerous in certain cases, due to the contactor not instantly going all the way home.

At the close of the meeting the members were invited to join the meeting of the New York Electrical Society in conjunction with the National Electric Light Association, which was also held in the Engineering Societies Building. A number of electrically driven piano players were demonstrated, and Lee De Forest exhibited his singing incandescent lamp. This is an adaptation of the audion amplifier, which under certain conditions emits musical tones.

Electrical Accidents; British Government Inspector's Report.

The annual report of G. Scott Ram, electrical inspector of factories, regarding accidents in factories, workshops and power stations in the United Kingdom, shows that in public lighting and traction power stations and substations there were 350 non-electrical accidents, seven of which proved fatal, and 31 non-electrical accidents in other stations, three proving fatal. The electrical accidents in both classes of stations numbered 99, an increase of 5 for the year, and they were made up as follows:

TABLE I.

At switchboards when engaged in ordinary routine work	26
Cleaning, repairing, etc., at live switchboards or other live conductors (two fatal)	49
Cleaning, repairing, or other handling of switchboards supposed to have been made dead (one fatal)	2
Adjusting brushes and cleaning commutators and flashing at commutators	6
Miscellaneous (one fatal)	16

The electrical accidents in factories, other than electrical power stations, numbered 350, including 16 fatalities. This represents a decrease of 68 or 16 per cent for the year. Table II shows the causes.

TABLE II.

Arcing of switches, 38; of fuses, 9	47
Shocks or burns when replacing fuse wires	22
Portable apparatus, connectors and flexible wires (two fatal)	65
Unprotected conductors, switches, terminals, fuses, etc. (seven fatal)	36
Working on live electrical apparatus or conductors, skilled persons, 42; unskilled, 46 (three fatal)	88
Miscellaneous electrical manufacturing and repair works accidents, chiefly in testing operations (one fatal)	55
Adjusting brushes and cleaning commutators and flashing at commutators	6
Miscellaneous (three fatal)	31

Concerning Table I, some of the accidents in the first line were due to mistakes on the part of the switchman; others were due to matters beyond his control, either to faulty switch gear or to faults on the circuit at some distant point. In all cases the injuries were burns. In one the tank of an oil switch burst and the attendant was injured by the burning oil. Six of the accidents occurred in the renewing of fuses. One-half of the station accidents occurred to men when working on live conductors, chiefly on switchboards. Eight occurred on extra-high-tension systems, and three on high-tension systems. In most of the high-tension accidents the injured persons were doing work which was unauthorized and they were themselves to blame.

An engineer attempted to do some work in a switch cubicle (10,000 volts); the switch was not in use, although alive on one side, and it could have been made dead by means of the isolating switches provided for the purpose. This, however, involved the taking down of a heavy iron screen, and rather than do this he took the risk. Mr. Ram says that this accident emphasizes the desirability that such doors should be hinged or made to slide on runners so that they may be readily opened.

One accident was caused through a short-circuit to the framework of the switchboard by the metal end of the insulating pole provided for operating the isolating switches. Sixteen of the accidents on medium and low-pressure systems were caused by making short-circuits by ordinary spanners, screwdrivers or pliers; one was due to short-circuit in attempting to remove the tank on a live oil switch.

An engineer-in-charge took hold of live conductors of a high-tension arc-lighting switchboard thinking they were dead. A switch controlling the switchboard had apparently, contrary to the usual custom, been inadvertently left on from a previous shift.

In the miscellaneous section of Table I the fatal case was that of a man who touched with his head a neutral conductor of a high-tension alternator. Several alternators were running in parallel, the neutral point of one being definitely connected to earth. It had previously been assumed that the neutral points of the other machines would have been very nearly at earth potential. In this case it appeared that there was 500 volts pressure to earth. The machines were of different types, and the one in question was of lower voltage than the others and connected through a step-up autotransformer.

Some of Mr. Ram's district staff point out that many contractors put in inferior apparatus and material on account of cheapness, knowing perfectly well that it does not comply with the government regulations, being afraid that if they tender for work which will comply with the requirements other contractors will not do so, and will get the orders on the question of price alone. The factory occupier eventually has to suffer, and is put to a greater expense in putting the matters in order, than if he had paid for the proper material in the first instance. Contractors should be called upon to put it right at their own expense. Local contractors are, however, beginning to realize that bad work is liable to be found out and condemned, and they are improving their standards accordingly. Attention is drawn to the inefficiency of earth connections on most installations. Some high-tension switchboards were found which had passageways only 18 inches wide and unprotected conductors all along one side.

The accidents in renewing fuses (Table II) afford examples of the dangers of different types of fuses referred to in previous reports by Mr. Ram. Most of the injuries were burns from short-circuit, but some were from shock. In some cases short-circuits were made by getting the fuse wire or pliers or other tool across the terminals of both poles or between one pole and the metal case. In some instances the fuses had been protected by a switch, but this being at a distance was not used. In other cases where there was a switch at the fuses it was connected on the wrong side so that the fuse terminals were live whether the switch was "on" or "off." Several occurred with fuses in porcelain carriers having the fuse wire in a groove in the front of the porcelain. In these cases the fuse having blown, the attendant replaced it without having investigated and rectified the fault which caused it to blow in the first instance, with the result that immediately the fuse-holder with the new fuse wire was put into contact, the fuse blew again, burning his hand. Others, causing shock, occurred with the "bobbin" or "grip" type carrier having live metal at each end of the porcelain. None of these fuses complies with the regulations. "Fuses not protected on the live side by switches should be of the switch-fuse type, so constructed that the hand when grasping the handle cannot touch live metal and is shielded from the arc should a fuse blow when being plugged in."

Turning now to accidents in the use of portable apparatus, 26 of these occurred in handling the flexible conductors. In one fatal case a man, working on the wet floor of a dry dock scraping a ship's bottom, is supposed to have trodden on the flexible cable of a portable lamp cluster, a nail in his boot piercing the insulation of the cable. Mr. Ram says that in many works there is no proper examination of the flexible conductors, which remain in use after being badly damaged and worn out. In some cases the metallic armoring of the flexible wires had broken and pierced the insulation. Metallic armoring, especially in the form of a wire helix, is not a desirable form of protection. The earth connection is liable to become disconnected, and through rough usage and constant bending the wire is likely to break and pierce

the insulation, and becoming live is very dangerous. Mr. Ram says that other forms of protection, such as rubber or hard-cord braiding are generally preferable. Twenty accidents in this class occurred in connecting the flexible wires to the circuit. In six cases "adapters" were being put into lampholders and short-circuits occurred. In other cases pin plugs of the old type were used, the wires short-circuiting at the point where they enter the plug. In most of these cases the use of safety-type hand-shield plugs would have prevented the accidents. The short-circuits which occur in this way are often very heavy, leading to very severe burns, by reason of the circuit being too heavily fused. In one case it was found that the circuit for a hand lamp was fused for 60 amperes.

Three cases of shock occurred from unearthed portable drills. A fatal case occurred, in a dry dock, in the use of a portable cargo lamp. A cluster of several lamps was mounted in a metal reflector and the whole fitting became alive by reason of a terminal screw in one of the lampholders being in contact with the barrel of the holder. The man took hold of the reflector of the fitting and was killed. The fitting was not earthed and it did not comply with the regulations.

After briefly summarizing the accidents of the "unprotected conductors" class, Mr. Ram refers to electrical testing work in electrical manufacturing works. This he says is largely carried on by apprentices and pupils as the ages of victims show. One experienced electrician, however, was killed by touching 2,000-volt wires, thinking that they were dead; two hours' application of artificial respiration was not successful. In another case a man touched some 12,000-volt testing leads and artificial respiration succeeded. In the other cases the injuries were mostly burns from short-circuits.

It is remarked that the testing departments of electrical manufacturing works are often carried on in a very unsatisfactory manner, there being unnecessary exposure of live conductors where they are liable to be accidentally touched. Any old connecting cables with damaged insulation are considered good enough; even in high-pressure testing unnecessary risks are run.

In one large armature winding shop it was customary to test the armatures by applying 2,000 volts between the commutator and the spindle. A twin flexible cable was connected to a transformer in a cabin, the other end being moved about to whatever part of the shop a test was required, perhaps 20 or 30 yards from the cabin. The cable terminated in bare ends projecting from short vulcanite sleeves. There was only one tester, who could, of course, not be at both ends of the cable at the same time. An accident occurred at an armature under test, the armature winder, who was applying the ends of the test leads, getting a shock. The tester was walking back to the test cabin where at the moment there was no one to switch off the current. In this shop also there was no one qualified or instructed in first-aid methods.

The inspector lays emphasis upon the need for artificial respiration being applied, refers to the fact that death in electrical shock cases is often only "apparent," and mentions the ignorance of the medical profession in regard to the matter.

Summarizing the fatal cases, all were due to shock from alternating current. Eighteen were due directly to shock, and two to fall following shock. Fifteen were from pressures of 440 volts or less. Most of the shocks being to earth from touching one conductor only of the system, the voltage received by the victim was less than the voltage between phases.

As usual many other reports by factory inspectors are issued simultaneously with that of Mr. Ram. Illumination questions receive only slight attention, and only brief reference to this and one or two other points is necessary here.

The importance of adequate lighting is being appreciated more every year, and though the inspectors have no statutory authority to require lighting generally, they have made suggestions, which have been adopted, remedying conditions which have been injurious to both eyesight and general health. "Though the more modern works have usually enough lighting force, the arrangements of the lights is often bad." The Bristol inspector (Mr. Shinner) refers to the injurious use of metallic-filament lamps with clear bulbs and very small shades, close to the eyes of the workers. He has recommended large, opaque shades, and comments thus: "Very little attention appears to be given to providing good, or rather well arranged, artificial lighting. I think it is largely left to any contractor who puts up the lights, and in regard to electric lighting the number of points affects the cost and tends to handicap proper distribution." Other inspectors report that great improvements have recently been made in artificial lighting by the substitution of electricity for ordinary gas lighting.

In referring to the difficulties surrounding the proper disposal of the dust and fumes collected by the fans in town factories, electrical deposition is advocated by Mr. Harston, of Birmingham, as being a better method than any commonly used. He mentions the successful operation of such a system in American factories for dealing with fumes and dust.

It is found that overhead electric cranes are responsible for a number of fatal and serious accidents. The importance of adequate sound signals has been impressed upon managers, and in numerous instances the means of access for the crane driver have been improved. In one works repeated accidents occurred, after conversion of the overhead cranes from rope drive to electric control, due to men being crushed between the crane framing and fixed vertical columns when leaving or approaching the cranes. Various devices were tried unsuccessfully, but no accident has happened since the installation of electric glow lamps, both near and at the top of the ladders leading to the crane tracks. These are automatically lighted as the crane approaches within a few yards of each ladder head.

Lighting With Gas.

The December meeting of the New York Section, Illuminating Engineering Society, was held in the auditorium of the Consolidated Gas Company, New York City, on December 8.

The first paper, on "Residence Lighting by Gas," was presented by M. A. Coombs, of the Consolidated Gas Company.

Among the advantages cited in favor of gas lighting, as it is being offerred for sale, were the low intrinsic brilliancy of the units themselves and the extensive use of diffusing glassware.

The second paper, on "Progress in Outdoor Lighting with Gas," was read by Charles I. Hodgson, of the Brooklyn Union Gas Company. Store-front and billboard lighting were the features taken up, the unit being the outdoor gas arc. The success of this branch of the company's business is based upon service, and the author dwelt upon the things which are essential to holding the customer as well as getting the business. By means of slides the appearance, equipment, fittings, magnet valve control, maintenance, inspection, sales efforts, booklets, advertising and the handsomely equipped gas offices, of which there are ten in Brooklyn, were all given due credit and consideration. The lamps are sold on an installment maintenance plan for $1.25 a month for two years, or $30. At the end of this period most of the lamps are then maintained under a regular maintenance contract.

The discussion was opened by J. E. Bullard, who felt that gas lighting has not received sufficient publicity. As an instance of the wrong kind of publicity, he cited a book published on the care of books in which the statement was made that gas was injurious owing to the effect of the sulphur on the bindings.

Norman Macbeth said that A. T. Stewart made his first success as a merchant when he tried to sell the things that the public wanted. The only competitor that either gas or electricity has is darkness.

J. P. Hanlan, G. E. Smith, H. T. Owens, E. C. Brown and Thomas Scofield also spoke.

School Lighting Discussed by Chicago Illuminating Engineers.

A meeting of the Chicago Section of the Illuminating Engineering Society was held in the Edison Building, Chicago, on the evening of December 9. W. A. Durgin acted as chairman. An illustrated paper was presented by M. Luckiesh entitled "Safeguarding the Eyesight of School Children." Mr. Luckiesh stated that very little has been published regarding appropriate lighting of schools as it affects the eyesight of school children. He referred to the work of the Committee on School Lighting, the primary object of which is the conservation of the children's eyesight.

Mr. Luckiesh reviewed the chief principles involved in satisfactory school lighting which he illustrated with numerous diagrams and curves. He referred to some studies made of the vision of pupils in Swedish secondary schools, showing that, although an improvement resulting in the reduction of nearsightedness had been evident in recent years, due doubtless to improved lighting in both schools and home, there is still room for much further improvement. The curves drawn up from this study showed that nearsightedness increased as the pupils advanced in their grades and was more noticeable in schools teaching classical subjects, due to much reading. Mr. Luckiesh then showed a large number of views taken in schools which were typical of bad lighting and of good lighting.

He then outlined briefly a preliminary code for school lighting which has been drawn up by the committee. Among the most important features emphasized are: The lighting should be referred to an expert before the plans are finally drawn; the minimum illumination on the desks in class rooms should be 2.5 to 3 foot-candles; glazed or glossy surfaces must be eliminated; glare from blackboards must be avoided; walls should be fairly light; window area must be ample and equivalent to at least 20 per cent of the floor area; the width of the room should not be over twice the window height; the ratio between maximum and minimum illumination should not exceed 100 to one; all artificial lighting should be from screened sources; local units should be avoided in shops, drafting rooms, etc.

Mr. Luckiesh also advocated strongly that school children should be taught how to conserve vision. The principles of good lighting should be incorporated in the course, particularly in the case of home-making classes. As a rule the arrangements for daylight have been found to be good, but in many cases where artificial illumination is used the conditions are very unsatisfactory. Where the lighting has been rehabilitated along the most approved lines there has been a growing tendency to use semi-indirect units. Mr. Luckiesh also referred to the work of the Illuminating Engineering Society of Great Britain which has made an extended study of school lighting.

The discussion of the subject was opened by John Howatt, of the engineering staff of the Board of Education, of Chicago, who touched on some of the practical difficulties of different systems of artificial lighting. A study of the subject in the Chicago schools led to the adoption of screened direct lighting equipment because it was believed that indirect systems would require too much cleaning. In the shops of manual training and technical high schools there has been found a need for localized lighting. The standard equipment for class-room use has been designed primarily to meet the particular conditions prevailing. About 30 of the Chicago schools are night schools. These have been studied with great care and their equipment has been remodeled first on account of the limited funds available.

Arthur H. Ford, of Iowa City, Iowa, suggested that prism glass was desirable for aiding the uniformity of daylight illumination in rooms over 20 feet wide. In the engineering drafting room of the University of Iowa Professor Ford said that individual lamps were provided because only a few of the desks are in use at night, and also because of a seeming psychological demand. He has observed that pupils demand much better light now than some 20 years ago.

M. G. Lloyd emphasized the need for good school lighting. A marked improvement has been noticeable in this respect in the schools most recently built. The lighting of the older schools should be rehabilitated as soon as possible. Need for further agitation of the subject is greater in suburban districts and small towns than in the large cities. Respecting the proposed code there is danger in going too far in standardization. The committee drafting the code should consider the possibility of radical changes in school-room design in the future; for example, a greater use of skylights in rooms entirely devoid of windows, since this arrangement doubtless gives the best daylight illumination.

J. R. Cravath recommended that the minimum illumination suggested in the code be raised to at least between 3 to 6 foot-candles, partly because many eyes require more liberal illumination and also because of the depreciation of lighting equipment. He also suggested that the maximum brightness should be lowered. He thought that the Chicago schools are meeting the conditions as they are now found very satisfactorily, but he hoped that it will be possible to go further in the future because the additional expense involved will well repay itself. Night-school students need particularly good lighting because their eyes are already fatigued from the day's work.

Albert Scheible criticized some features of Professor Ford's suggestions, especially the use of local lamps in drafting rooms. He believed that indirect systems have now been designed that are capable of ready cleaning from the floor.

Otis L. Johnson also spoke very strongly in favor of general lighting in shops with practical elimination of local lighting. Extension cords or local lamps should be used only where absolutely necessary. The ordinary workman is no judge of proper lighting and the pupil in a school is still less fitted for proper judgment of this matter.

H. D. Butler mentioned several schools in the western suburbs of Chicago where skylights are used with very good results. He also mentioned schools in several cities where pure indirect lighting is very successfully used.

W. A. Durgin thought it was as reasonable to give each pupil an individual source of light as it would be to provide them with individual sources of heat. The use of gas-filled tungsten lamps is increasing so fast now that any direct lighting system installed is soon likely to be entirely unsatisfactory because not adapted to the use of the more efficient lamps. Others who discussed the subject were K. A. Auty and A. L. Arenberg.

The discussion was closed by Mr. Luckiesh, who stated that the suggestions of the code were only tentative and much condensed. He urged that even the older schools have their lighting systems entirely remodeled which can be done at very low cost. He also spoke strongly against the use of local lamps on drafting boards, sewing tables, lathes, etc., because pupils have very vague notions as to how to manipulate such local lamps properly. There are 18,000,000 school children in the United States, a very large number of whom have defective vision. A proper consideration of the economic value of such vision to the pupils shows the importance of making the conditions of lighting as favorable as possible in all the schools. Respecting the use of glare-free paper for text books, he believed that such a paper of comparatively low cost is now available.

Additional Electrical Prosperity Week Returns.

Reports from Philadelphia, Atlanta, Texas, Denver and Elsewhere Indicate Marked Stimulation of Business as Result of Campaign.

Philadelphia Campaign Results in 1,160 House-Wiring Contracts.

Electrical Prosperity Week in Philadelphia was very much more successful and celebrated in a very much more general way, throughout that city, than had been anticipated or even hoped for by the most optimistic. The Philadelphia Electric Company was extraordinarily successful in obtaining the co-operation of the business men throughout the city in the entire celebration. The co-operation of the electrical fraternity throughout the city, other than the central-station representatives, was to be expected, but the extent of the co-operation finally obtained was again due to the carefully laid plans of the central station.

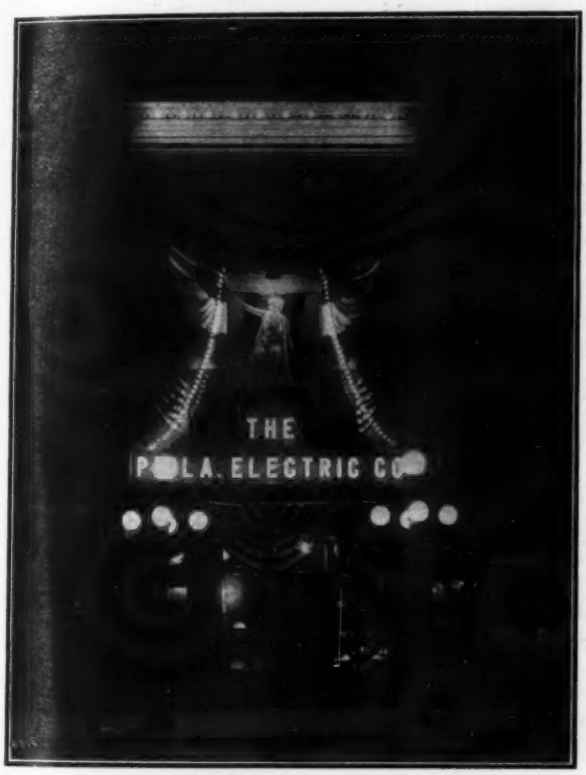
All the preliminary work was handled by a committee of the Philadelphia Electric Company's employees, and all the details were worked out by them. It was decided quite early in the game that something to hang Electrical Prosperity Week upon was absolutely necessary. In other words, that unless the Electric Company had something definite to offer the public, other than general prosperity talk, they could not expect the public, generally, to enter into the spirit of the occasion from the viewpoint of the industry.

The offer as finally evolved and presented was as follows: "To celebrate Electrical Prosperity Week the Philadelphia Electric Company offers an allowance of $1.00 per current consuming outlet on the cost of wiring any already-built house or store located along its existing lines and requiring no other than the ordinary service connections, provided that the contracts for both wiring and service were signed between November 1 and December 4."

This $1.00 per outlet allowance meant a saving of practically 20 per cent upon the cost of the wiring. The company, in its advertisements, pointed out that it was not in the wiring business, therefore the amount of the wiring estimate obtained from the favored contractor, of the prospective customer, was not influenced in any way by this offer and that the $1.00 per outlet allowance, therefore, was a positive saving. This offer was, naturally, enthusiastically received by the wiring contractors inasmuch as they were not asked thereby to give up any of their profits. It was so favorable an offer that all the progressive contractors added to their force of salesmen and actively aided the canvass made by the salesmen of the Philadelphia Electric Company.

While this offer naturally interested the public, the active co-operation of the business men was obtained in a different way. Philadelphia as a city, in addition to the main business center, contains six or eight retail business districts which are, in effect, almost separate small cities. The business men in all of these districts are banded together in numerous business men's associations. These associations are most active in endeavoring to keep the purchasing public of each district from buying elsewhere. The district offices of the Philadelphia Electric Company are located in these various sections, and the district managers are members of the business men's associations. It was pointed out to these business men that it was to their great advantage to endeavor to "cash in" on the enormous amount of advertising that was being done all over the country to make Electrical Prosperity Week a national event and the especial timeliness of this week was pointed out as a stimulus to the Christmas "Shop Early" movement. The result was that the business associations in almost every section co-operated by inaugurating a local "Booster Week."

The electrical interests in the city, headed by the central station, constructed



Typical Decoration of Philadelphia Electric Company's Stores.

Prosperity Week Decoration of Newspaper Office Building.

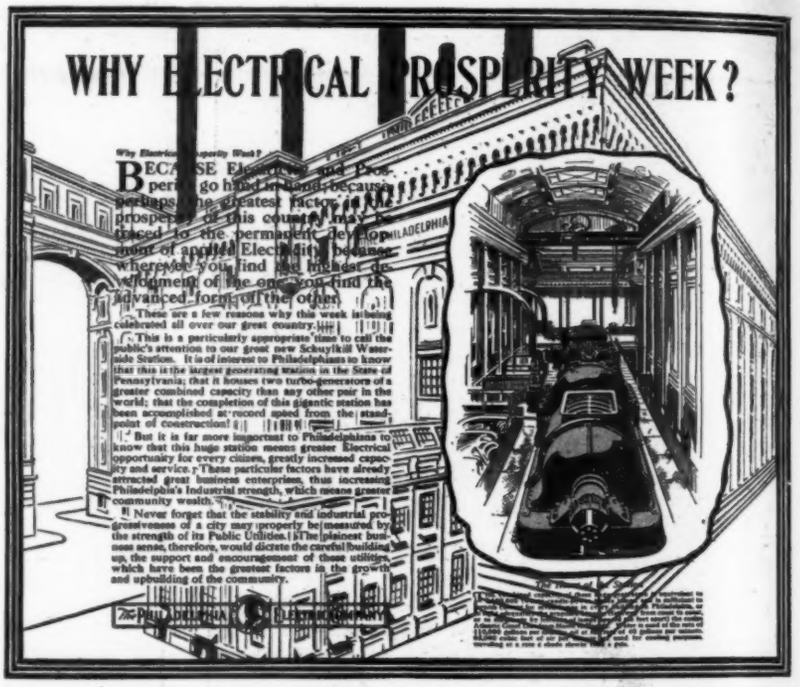
about 15 floats, all of them electrically illuminated and most of them quite elaborate in character. A schedule was arranged so that each business district was given one night upon which this electrical parade would traverse the principal business streets of its section. This created a great deal of enthusiasm, and the business men in each district co-operated by entering floats, decorated trucks and delivery wagons, automobiles, etc., in these nightly parades. As a result these parades contained from 75 to 150 entries, representing the local business men.

In one district, the Government was represented by two "Preparedness" floats, entered by the United States Arsenal. In many of the districts cash prizes were offered by the business men's associations for the best decorated floats, the best electrically decorated windows, and the best electrically decorated buildings; these prizes aggregating $500 per night, all of which money was put up entirely by the business men. The business houses along the routes of the parades, in each district, were most elaborately decorated by bunting, flags, electrical streamers, and in fact all of those deocrations which are used, from time to time, to celebrate great events.

Naturally, all this enthusiasm and co-operation could not have been obtained without liberal advertising. The Philadelphia Electric Company, of course, shouldered this end of the expense. Practically all of the advertising matter furnished by the Society for Electrical Development was utilized, such as street-car cards, window cards, muslin signs, lithographed window posters, poster stamps, folders, etc. In addition to the Society's printed matter the company issued a great deal of individual advertising. Thousands of folders were mailed containing the wiring offer. Two thousand four hundred street-car cards carried similar advertisements. The company "Bulletin" was made an Electrical Prosperity Week number and sent to all customers prior to the week. Large newspaper space was utilized in the daily papers, and spreads were used in all the local newspapers. Illuminated sign boards were used for one month in advance of the week, and special advertising letters, containing the house-wiring offer, were sent to the names of those on prospect lists.

The results, as stated above, were beyond all expectation. The parades during the week were witnessed by exceedingly large crowds, and the most favorable comments were elicited. The daily newspapers, during the week, contained columns of reading matter relative to Electrical Prosperity Week generally, and its features locally. There were numerous editorials upon the subject of electricity. The City Hall was illuminated in outline lighting throughout the week. The Bell Telephone Company and the main buildings of the Philadelphia Electric Company were illuminated by flood lighting, and all of the Philadelphia Electric Shops and district offices were elaborately decorated inside and out.

The Week in Philadelphia was an unqualified success; not only as far as the public was concerned, but also from the standpoint of closer relationship between the electrical interests. The wiring offer resulted in the signing of approximately 1,160 contracts, which means at least $100,000 worth of business for the electrical contracting firms. It is figured that 20 per cent of these contracts, or something over 230, would have been secured anyway in the normal run of business; but that the other 80 per cent—or about 930 contracts—may legitimately be credited solely to the special offer and the intensive sales campaign of the central station and electrical contractors.



An Advertisement Published During Week by Philadelphia Company.

Two points worth noting are that all this new business was secured at the regular prices for wiring, the allowance being borne by the central station; and, further, that the number of wiring contracts secured by each contractor was in direct proportion to the energy and aggressiveness he displayed in capitalizing the interest stirred up by the central station's advertising.

Atlanta's Activities.

Electrical Prosperity Week was celebrated in Atlanta by an Electrical Show held in the Healey Building, one of Atlanta's latest and finest office buildings, one-half of the entire ground floor being used for the Show. The General Committee in charge of the Show was headed by Rawson Collier, of the Georgia Railway & Power Company.

The Show opened promptly Monday morning, November 29 and the attendance showed a steady increase each day during the week, the attendance on Saturday being more than 100 per cent in excess of the attendance on the first day. The total attendance for the week was approximately 14,000.

News items appeared in all of the Atlanta papers each day of the Show, these items generally occupied about a column of space, and towards the latter part of the week, editorials appeared in all of the papers calling the attention of the people to the Show and its educational value. The program of special days was as follows: Monday, Georgia School of Technology Day; Tuesday, College Day; Wednesday, Anti-Tuberculosis Association Day; Thursday, High School Day; Friday, Rotary Club Day; and Saturday, Children's Day.

Music was furnished by the Automatic Player Piano Company, which installed a $5,000.00 electrically operated Orchestron, and each day special numbers were presented. On Rotary Club Night, the entire Rotary Club attended the Show in a body and after spending an hour in inspecting the exhibits, the Club held an electrical dinner at the Hotel Ansley. After the dinner at which electrical favors were given to all of the ladies, there was a dance, the room being festooned with small lamps, these lamps working from a flasher. On Saturday Night after the Show, an electric supper was given to all those participating in the Show, by Rawson Collier.

The Rotary Club at its regular meeting on Tuesday following the Electrical Show, gave an electric luncheon the

Outdoor Banquet Held at Waco, Tex.

favors being a replica of Edison's original lamp. A talk was made by Evanda H. Ginn of the General Electric Company, his subject being "Electrical Interests in Atlanta." This paper proved to be one of the most interesting papers ever read before the Rotary Club in Atlanta. At the dinner, essays were submitted by the various ladies present, the essays being entitled "Advantages of Electricity in the Home," a prize being awarded to the lady writing the best essay.

Electrical Prosperity Week In Texas.

The results obtained through "Electrical Prosperity Week" in Texas cities operated by the Texas Power & Light Company show what can be done in even the smaller towns when the proper effort is applied.

Perhaps the most unique and noteworthy celebration in the State was the "Prosperity Banquet" held in the street in front of the Texas Power & Light Company's office in Waco, Texas. The success of this banquet is more remarkable due to the fact that it followed within a few weeks after the Waco Cotton Palace, an annual fair and exposition held in this city every year by the commercial organizations. The mild Texas climate made the banquet possible.

This stunt was staged under the auspices of the Waco Young Men's Business League, an organization that has been very active in promoting the prosperity of the city. One of the members of the league was approached early in the campaign and told of what was being planned for "Electrical Prosperity Week" and his co-operation was secured. The time was very opportune due to the fact that over $1,000,000 worth of good roads had recently been completed, something to make everyone rejoice. Accordingly the matter was brought up and met with instant response. It was decided to hold the banquet and to invite the farmers from the surrounding territory as guests of the occasion in celebration of the completion of the good roads and the general prosperity of the section. It might be mentioned here that this progressive attitude on the part of the merchants is one that has been consistently followed in Waco and has been a great factor in bringing in trade.

Committees were appointed and everyone was given an opportunity to help the good work along. The necessary money was obtained by selling "Prosperity" badges at $1.00 each. The local manufacturers contributed flour, coffee and most of the other necessities for the feast and other merchants and manufacturers prepared this material. W. C. Duncan of Texas Power & Light Company was given charge of the illumination, which was donated by the Company, and one has only to glance at the illustration herewith to see that the street was made as bright as day. Green sawdust was sprinkled over the street which made it look very much like a lawn party.

The banquet was held on the evening of Tuesday November 30. Over 1,500 persons partook of the big meal and as many more watched the proceedings from the sidewalks. No other celebration ever held in Waco made such an impression. The local papers were very liberal in their support of the idea.

Perhaps one of the most noteworth announcements during the banquet was a statement by J. F. Strickland, president of the Texas Power & Light Company and the Southern Traction Company, who spoke on "Electrical Prosperity" that there was a good possibility that the present interurban from Dallas to Waco might be extended to Temple and Austin during 1916. He also stated that there was a possibility of an interurban from Waco to Houston via Marlin. These lines will mean much for the development of Waco when they are finally built.

The celebration in Brownwood, Texas was started at a meeting of the Chamber of Commerce and was later taken up with the Retail Merchants' Association. A few days after this a joint meeting of the two bodies was held and it was at this meeting that the real enthusiasm was generated. Every man present agreed to devote at least an hour a day to committee work if called on.

Typical Street Scene in Texas Town.

Float Used in Philadelphia Parade.

The local papers agreed to publish nothing but prosperity news on their front pages during this week and it might be mentioned that this one feature was the biggest factor in the week's celebration.

Each day of this week was made a special day. One day was "Pay-Up" day, another was "Chamber of Commerce" day and so on throughout the week, Saturday being "Farmers'" Day. As an indication of the success of this plan, during "Chamber of Commerce" day over 100 new members were obtained.

Another notable feature was the support which the local merchants gave the newspapers. Over 5,000 inches of advertising was pledged by the merchants for this week. This in a town of some 10,000 population is remarkable.

In Hillsboro, Texas the retail merchants and the business league also co-operated, the week being designated as "Prosperity and Pay-Up" week. All the stores were decorated in Christmas attire. An aviator was secured for the occasion and a carnival was also made a feature. On the first day, Monday, over 2,500 persons were in town for the celebration. And this in a town of not much more than 8,000 population. Again it goes to show what co-operation will do. The city was made bright by special festoons of electric lamps hung by the Texas Power & Light Company. Reports show that the merchants did a big business and were able to start there holiday trade going in full swing during this week.

Temple also had a "Prosperity Week" the Chamber of Commerce, Young Men's Business League and the Retail Merchants co-operating. No special features were noted but holiday trading was greatly stimulated.

The idea of the Texas Power & Light Company in making this a "General Prosperity Week" and inviting the co-operation of the merchants explains the success of the general plans. Only a few towns were worked on this year, it being thought that it would be better to make a successful show in a few towns than a half success in all the towns operated by the Company.

Directly the company profited by iron-exchange sales which were put on through the local contractors, 25 cents being offered that week for old sad irons, the amount being applied on the purchase of a new electric iron.

Indirectly the company has profited in good will of the merchants. Without exception the citizens of these towns praised highly the liberal policy of the Company and its attitude in making this celebration a co-operative one.

Next year the Company hopes to start the ball rolling for a "Texas Prosperity Week" to be celebrated in every town in Texas.

Denver Holds Noteworthy Celebration.

If Electrical Prosperity Week in Denver had produced no result other than to advertise electricity for lighting, heating, cooking and power purposes, the expenditure of money and energy by those interested in its success would have been justified.

An analysis of the week and the electric show indicate remarkable results were attained.

In the first place, it provided opportunity to give extensive publicity to electricity and electrical devices of all kinds, therefore, fulfilling the primary purpose for which the week was intended.

Secondly, or, perhaps, it might be considered first in importance, the campaign, as handled by Denver electrical men, produced a result exceedingly pleasing to the central station. It made hundreds of friends for the Denver Gas & Electric Light Company. This was due mainly to the efforts of the company in advertising its consumers—the business men and manufacturing men who spent large sums yearly for the purchase of light, heat and power.

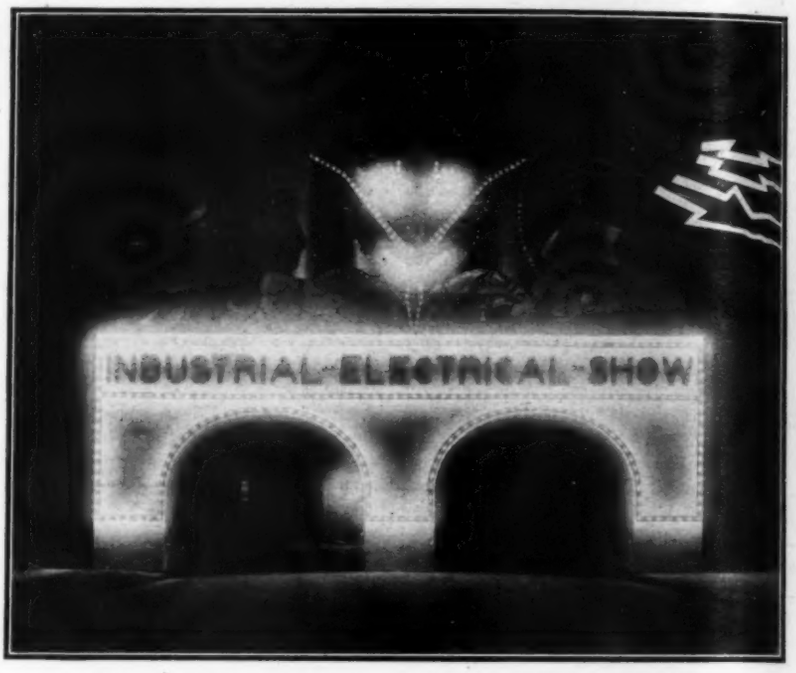
As will be conceded this method of procedure gained the friendship for the company of the men thus advertised, and they in turn, feeling gratified, sought to show their appreciation by spending their own time and money in boosting Electrical Prosperity Week, the electric show held in conjunction with it, and incidentally the Denver Gas & Electric Light Company.

Another important feature of the celebration, which has been especially noticeable since the close of the prosperity celebration, is the increase in the company's Christmas trade. It gives promise of being the biggest year in the company's history, and already the books show a 25-per-cent increase in Christmas sales over the same period of last year.

Judging Electrical Prosperity Week from the effect it has had in Denver it would appear that the week set aside by the Society for Electrical Development for the advertising of electricity and electrical appliances was well timed.

If other cities throughout the country have experienced results similar to those of Denver electrical interests, electricity and appliances which consume it will have received the greatest impetus in the history of the industry.

To William J. Barker, vice-president and general manager of the Denver Gas & Electric Light Company, belongs much of the credit for the success of Electrical Prosperity Week in Denver. Plans devised by him were placed in the hands of a corps of competent assistants. These men were grouped into committees with Mr. Barker directing them.



Entrance to Denver Auditorium, Where Electric Show Was Held.

Advertising played an important part in the campaign. Newspapers, due to the efforts of a corps of publicity experts, issued special editions giving publicity to the affair.

Every conceivable form of advertising was utilized to call attention to the celebration. In addition to newspaper advertising the phrase "Electrical Prosperity Week" stared at 250,000 Denver people from billboards, street cars, the show windows of every department store, manufacturing concern and a hundred odd other business concerns.

The Denver newspapers did themselves proud in playing up Electrical Prosperity Week in their news columns. How much this advertising was really worth cannot be figured in dollars and cents. In the first place it was advertising that could not have been purchased at any cost.

In the hands of John M. Connelly, publicity manager of the Denver Gas & Electric Light Company, was intrusted the duty of advertising the electric show and Electrical Prosperity Week. The results accomplished best demonstrate how successfully the plans were executed.

The plan of selecting a queen to preside over the show was hit upon and eventually carried into effect. Electra was the name chosen for the queen.

Impressive Exhibit of Hot Springs Company.

She was selected from among hundreds of Denver's most beautiful women, five artists having national reputations judging her as the most perfect in beauty, carriage and figure of those responding.

On the night of her coronation, November 30, thousands of persons packed the Denver auditorium where the electric show was held. Mayor William H. Sharpley crowned her queen of the show. He was introduced by Clare N. Stannard, secretary of the Denver Gas & Electric Light Company.

Manufacturers and business men desiring knowledge on the latest in electrically power driven machines and lamps for interior and exterior illumination purposes were attracted to the show by the personal touch which the company used in its advertising campaign.

Advertisements seeking to attract their attention and which had the desired result, probably are unique in the electrical industry. It was these advertisements which gained the Denver Gas & Electric Light Company hundreds of friends among the best business men and manufacturers of the city.

Hot Springs, Ark., Celebrates.

Electrical Prosperity Week was celebrated in Hot Springs, Ark., in a manner that far exceeded any event of its kind ever held in that community. Steven Mather, assistant secretary of the Interior and W. P. Parks, superintendent of the United States Reservation, representing the government, the Business Men's League, Merchants Association and all lines of trade took part in the brilliant parade which was held on the night of December 2.

One of the features of the parade was the exhibit of the Hot Springs Street Railway Company, which had in line a mule-drawn street car used 30 years ago and which was followed by a modern double-truck car, the latter being brilliantly illuminated with varied colored electric lights. This car was occupied by young ladies singing patriotic songs.

Minneapolis Jovians Celebrate During Week.

Bubbling over with enthusiasm and crammed full of plans for the future entertainment of Minneapolis Jovians, the newly elected Jovian officers and Jovians in general are still talking of the wonderful success of the Electrical Prosperity Week social which was held in Minneapolis, Minn.

The Minneapolis affair really goes to show what can be accomplished in the way of a good get-together electrical party when the proper spirit within us is aroused, lethargy is cast aside, and action is the word.

Of course the most interesting event of the week was the social. In addition to this there was a mighty display by a battery of searchlights from the roof of the office building of the Minneapolis General Electric Company, the local central station, which attracted city-wide attention and added considerably to the week's publicity. Aside from the Jovian activities the part played by Minneapolis in the nation-wide movement consisted mainly of newspaper advertising, each of the three English dailies carrying a full electrical page of paid advertising, each paper devoting several columns of interesting write-up to electricity in general.

Especially attractive offers by all dealers and department stores was the principal feature contributing to the large sale of appliances for the week which undoubtedly reached unusual proportions. The local central station, in spite of the fact that it handles devices in only a very limited way, reported twice the average number of sales.

Business Stimulated in Louisville.

Celebration of Electrical Prosperity Week in Louisville was so successful that the Jovian League, which held an electrical exposition at the First Regiment Armory, has been asked by a number of the exhibitors to repeat the event next year.

The business results of the displays were splendid, it was reported. Dealers and contractors received a marked stimulation of their trade, and exhibitors of goods like electric vehicles made a number of sales at the show.

Indicating the possibilities of the exposition from the standpoint of business-getting, the Louisville Gas & Electric Company, which had a booth fitted up chiefly as a rest room, conducted a contest to determine the number of beans shown in a 1,000-watt nitrogen globe. A hole had been bored in the bottom of the globe and beans of all sorts and sizes put in, after which the hole was covered with sealing wax. The feature of the contest was that the first prize was to be awarded only to a person having an unwired house, those whose houses were wired being eligible to the other prizes, consisting of electrical appliances. The first prize was $25 toward wiring a house for electricity. Indicating the amount of interest excited, over 9,000 guesses were entered, and of these 2,200 were submitted by people with unwired houses. The company secured about 700 live prospects, as those who submitted guesses were required to state whether they were "interested."

National Independent Telephone Association and the Independent Association of America Hold Joint Convention and Merge to Form United States Independent Telephone Association.

An important event in the history of independent telephony was the gathering at the Hotel La Salle, Chicago, on December 8, 9 and 10, in joint convention of the National Independent Telephone Association and the Independent Telephone Association of America. As a result of the meeting a reunion of the two organizations followed in which each gave up its existence to form a new association called the United States Independent Telephone Association. The meeting was attended by nearly 1,000 delegates, and was said to be the largest gathering of independent telephone men ever held in this country.

On the morning of December 8 each of the two associations held a brief separate meeting. President C. Y. McVey, of the old National Association, called upon S. G. McMeen, Columbus, O., to explain the negotiations of the last few months, which led to bringing the two organizations together. It was realized that the growing number of important problems, particularly relating to regulation by the Interstate Commerce Commission, and by various state commissions, called for united action on the part of the telephone men. Other addresses were made along the same line, and it was then moved that the Association dissolve, a Liquidating Committee taking care of its final finances and other matters. At the same time the Independent Association of America had a brief session presided over by E. B. Fisher, Grand Rapids, Mich., who called on Secretary W. S. Vivian to explain the proceedings that led to the consolidation. Upon motion this Association also was dissolved, and all of the members, as those of the old National Association, were urged to join the new United States Independent Telephone Association.

Upon the conclusion of the brief separate meetings, the first joint session, constituting the first meeting of the new United States Independent Telephone Association was called by E. B. Fisher, chairman of its board of directors. Addresses were made by Mr. Fisher, President McVey, of the new Association and others. Mr. McVey then presented his retiring address as president of the old National Association, in which he dwelt upon the fact that the independent movement was just 21 years of age. When it began in 1894 there were scarcely 30,000 telephones in the United States. At the present time there are nearly 10,000,000 independent and Bell telephones in use in the country. He reviewed the work carried on by the National Association during the past year, particularly the work of its Committee on Accounting. He urged loyalty to the new Association and united and harmonious efforts. A brief address was also made by E. B. Fisher as retiring president of the Independent Association of America, in which he referred to the work undertaken by it in conducting operating schools for service betterment and other activities of the Association during the past year.

F. B. MacKinnon, retiring secretary of the National Association, presented a report on the work of organization, referring particularly to further negotiations with the American Telephone & Telegraph Company regarding the toll-line contract. Further work along this line will be undertaken, and about January 15 next a joint committee representing the Bell and independent interests will begin an exhaustive study of the toll situation in various parts of the country, investigating all classes of existing arrangements for interchange of toll business. The committee will visit various toll centers to ascertain the exact conditions prevailing, and to work out methods for mutually satisfactory agreements. Much attention has been and more will be given to the working out of the famous valuation order No. 18 of the Interstate Commerce Commission. W. S. Vivian presented his report as retiring secretary of the Independent Association of America, referring particularly to the work that has been conducted along lines of standardization of telephone transmission and of improvement in service work. During the past year Mr. Vivian conducted about 30 operators' schools.

The session on Wednesday afternoon was opened by an address of welcome by William R. Moss, on behalf of the Chicago Association of Commerce. This was eloquently responded to by N. G. Hunter, of Wabash, Ind., on behalf of the Telephone Association.

Beecher W. Waltermire, chairman of the Ohio Public Utilities Commission, made an address on "Commission Regulation of Public Utilities." He called attention to the very rapid increase in the growth and importance of public utilities in this country. The necessity for utility regulation has become more and more felt in recent years; when this era began a feeling of hostility was marked on both the side of the public and the utilities. It is imperative that this feeling of antagonism should be eliminated and that harmony should prevail. Mr. Waltermire decried the tendency to let politics enter into regulation, since economic questions like this cannot be settled at the polls.

On Thursday morning the session was devoted entirely to accounting, being conducted by the Accountants' Division with L. R. Parker, of Columbus, O., chairman. The work of the joint Committee on Accounting, composed of representatives of the American Telephone & Telegraph Company and of the Independent Telephone Associations, was briefly referred to. This important work will be continued, and its results will not be available until perhaps about one year. Brief addresses were made by F. W. Sweeney, chief examiner of accounts of the Interstate Commerce Commission; E. M. Prisk, Hazelton, Pa.; C. P. Russell, Lincoln, Neb.; A. L. Staferman, Terre Haute, Ind.; J. W. Van Sant, examiner of accounts of the Interstate Commerce Commission; J. M. McShane, chief accountant, Missouri Public Service Commission, and others.

On Thursday afternoon the session was opened with an address by A. J. Shands, St. Louis, Mo., entitled "The Traffic Manager from His Own Viewpoint." The speaker reviewed the duties of the traffic manager. He must see that the service provided is rapid and yet accurate and courteous. Mr. Shands urged strongly that managers should thoroughly acquaint the operators with the proper procedure, and impress upon them that they are the sales representatives of the telephone company.

Statistician Meyers, of the Interstate Commerce Commission, spoke briefly on the importance of the auditor in any telephone system, particularly in relation to the statistics required by the Interstate Commerce Commission. In order that these may be of any value there must be a uniform system of gathering and reporting the figures. He reviewed the work on uniformity of accounting as regards reports of railroad companies which has been done by the Commission. LeRoy Parker, Columbus, O., then spoke on "The Auditor from His Own Viewpoint." He called attention to the increased value placed upon accounting by all up-to-date telephone companies, and, in fact, by all utility companies.

L. E. Hurtz, Lincoln, Neb., then read a paper entitled "The Plant Superintendent from the General Manager's Viewpoint." He outlined the organization of larger telephone companies, and explained the interconnection of the various departments. In each of the departments specialization must be carried out to a high degree, but their activities must be carefully co-ordinated.

At the banquet held on Thursday evening chief interest centered in the address made by William Howard Taft, former president of the United States.

Another important address was that made by Robert B. Glenn, former governor of North Carolina. S. G. McMeen was toastmaster.

The final session of the convention on Friday morning was devoted to standardization. R. V. Achatz, Lafayette, Ind., explained the work that has been undertaken and accomplished by the Standardization Committee. A tentative code specifying standards of telephonic transmission has been compiled, the study of which was urged. All the independent companies should attempt to improve their transmission as far as possible to the standards defined.

F. J. Heavens, Pittsburgh, Pa., spoke on the need for standardization. Although telephony is now the fourth industry in importance in the country, it is the least standardized of the leading industries. A great variety of standards of telephone transmission are in use, in fact, in many plants no standards whatever exist.

W. H. Hay spoke on what the adoption of the proposed standards would mean to the operating companies. He emphasized the value of toll business to any company. This can be obtained only by providing high-grade transmission. He narrated several instances in which the transmission was greatly improved by relatively simple changes in the present plants, usually by replacing wornout or antiquated equipment. He analyzed the conditions in central offices, lines and substations, pointing out how slight improvements here and there will have a very important effect upon the transmission. However, standardization of transmission is not the only thing to be taken up. Uniformity of operating practice is nearly as imperative as improved transmission.

Arthur Bessey Smith spoke on standardization from the viewpoint of the manufacturer. Heretofore telephone manufacturers have sometimes been compelled to sacrifice transmission to improved switching methods. Most of the manufacturers, however, already make telephone equipment in accordance with the proposed standards. He pointed out that there are two aspects of standardization, the first being the setting up of standards by which transmission can be measured; second, that the standard transmission specified should be the practical limit for which the public is now willing to pay. There is great need for standard means of measuring the transmission prevailing. Great improvement has already taken place among the manufacturers in testing equipment put on the market.

H. D. Currier spoke on the influence of standardization upon the independent telephone business as a whole. He said that standardization really means only good management. It should be noted that standardization is necessary in all branches of the telephone business, construction, operating, accounting, etc. Many managers think they know the entire telephone business. However, the latter has so developed that specialization is imperative. Improved transmission means calling upon telephone experts to make a study of every plant. Even though many present comparatively inefficient plants are a commercial success, a study of each plant to reduce its losses and to improve its transmission efficiency, will make a very decided commercial improvement.

Frank A. Wolff, of the Bureau of Standards, Washington, D. C., reviewed the work of this organization, which now has grown to have over 400 employees, over two-thirds of whom are engaged in scientific work. He described the institution and its facilities, and gave an outline of its most important branches of activity. The United States now has the largest standardizing laboratory in the world. The principal activities now are the establishment and maintenance of standards of measurement, standards of quality, standards of performance, standards of service and the promotion of industry. Some of these were explained by Dr. Wolff at length, and he also pointed out some of the more recent work in the drafting of standards of gas and electric service, and of the proposed electrical safety code, which is now in process of formulation. He said the Bureau is in hearty sympathy with the Association on standardization and would co-operate as far as possible in furthering the work.

The subject of standardization was also discussed by President McVey, Secretary Vivian, H. B. Folsom, W. C. Polk, E. B. Fisher, Francis Dagger, L. E. Hurtz, H. E. Bradley, R. H. Polk and others.

The report of the Committee on Resolutions was then presented by its chairman, Judge N. G. Hunter. Three resolutions were recommended and adopted as follows: the first urging that state commissions prescribe a fiscal year for telephone companies to be the calendar year, as is required by the Interstate Commerce Commission; second, urging that Congress appropriate sufficient funds to enable the Bureau of Standards to take up a study of the standardization of telephone transmission, apparatus, etc.; third, resolutions of gratitude for the participants in the banquet, the hotel management, and others who had contributed to the success of the convention. The meeting then adjourned.

As usual, the manufacturers of telephone equipment made very representative exhibits of their apparatus and supplies which occupied all of one floor of the hotel.

The officers of the new United States Independent Telephone Association, who were elected at a meeting of its board of directors held on December 7, are as follows:

Chairman of the board, E. B. Fisher, Grand Rapids, Mich.

President, C. Y. McVey, Cleveland, O.

First vice-president, W. H. Bryant, Mobile, Ala.

Second vice-president, G. W. Robinson, St. Paul, Minn.

Third vice-president, F. B. MacKinnon, Washington, D. C.

Secretary-treasurer, W. S. Vivian, Chicago, Ill.

Electrical Credit Men Hold Annual Convention in Chicago.

A closer co-operation between the credit and sales departments of electrical companies was the keynote of the annual meeting of the Electrical Credit Association of Chicago, which was held at the Hotel La Salle, on December 9.

It was suggested in the course of the discussion that at the sales conferences which form an important feature of the commercial activities of most companies the credit department should be represented and credit methods explained. The salesmen come in closer contact with purchasers and prospective purchasers than do men of any other department and if they are properly advised as to credit matters they can often act as missionaries and tend to overcome unpleasant relations between the purchaser and the house.

A. J. McGivern, sales manager of the Manhattan Electrical Supply Company, took a leading part in the discussion at the meeting in advocating such activities, and suggested that it would be a good plan to gain cooperation with the salesmen by offering suitable prizes to the salesman in whose territory the least credit loss was suffered during the year. The value of house and interdepartment conferences was pointed out by C. H. Minor, of the Western Electric Company, who presented a paper on this subject. It was shown that the individual is disappearing in all important business houses, although the human element in business should not be neglected. House conferences are stabilizing, educational, harmonizing and humanizing. Department conferences make for the greater co-operation and for departmental protection.

The question as to whether salesmen should be asked to collect accounts was discussed by A. H. Powell and J. L. Hall, it being conceded that

while a salesman is in a position to collect valuable data for the credit department, it is not desirable to ask salesmen to collect accounts, as it is likely to hurt their standing with the customers, particularly among those who, while good credit risks, are not always in a position to pay bills promptly.

The election of officers resulted as follows:

President, Henry Schwab.

Vice-president, A. O. Kuehmsted.

National representative, F. M. Pierce.

Secretary-treasurer, Frederic P. Vose.

Assistant secretary-treasurer, Walter S. Vose.

Members of the Executive Committee, H. O. Claire, for two years and Thomas I. Stacey and S. E. Kennedy for three years.

Papers dealing with the Electrical Credit Association and its relation to the industry were presented by W. W. Low, W. R. Herstein, G. A. Richards, W. W. Johnson and others.

The meeting concluded with a dinner and entertainment in the evening, the affair being characterized as "Stunt" night.

SYSTEM OF KEEPING RECORDS OF CURRENT WORK IN ELECTRICAL INSPECTION DEPARTMENT.

By Washington Devereux.

Applications.

Applications which arrive in the first morning mail are received by the Electrical Department. These are looked up in a certificate cabinet to determine whether or not a reinspection was ever made of the electrical equipment and repairs not completed. If there is a reinspection on the risk the application (Fig. 1) is immediately turned over to the reinspection clerk. If there is no reinspection on the risk the full rated location is placed on the application. Application is then passed to the inspector in whose district the risk is located. After the inspector has made a copy, on form shown in Fig. 2, of the location of the risk, name of the occupant, equipment, source of supply and name of contractor, the application is placed by him in a cabinet provided for this purpose, which cabinet is divided into compartments, the compartments each bearing the name of the inspector. These applications are then gathered by a clerk and delivered to the cashier who, with an automatic numbering stamp gives each application a consecutive number, known as the application number. Each application is then entered in its proper order (with reference to the application number) in the Electrical Inspection Record Book, and a receipt for the cash payment is immediately mailed to the applicant.

This book contains columns for date, name of applicant, location, date paid, cash, charged. Applications which arrive during the day are received by the cashier. If applications are made by firms having charge accounts, bills are rendered at the end of the month. If the installation is not completed at the end of the month, a charge is made for the equipment reported, in accordance with a schedule of charges, and the contractor billed for the balance of the installation upon completion, if original report was not correct. If overpaid a rebate is made to the applicant. The inspectors' reports on these applications, upon completion, are referred to the cashier by the Electrical Depart-

Form 139. 1500-7-1911

Certificate No. ..... Application No. ..... File No. .....

Philadelphia, ... 191....

Philadelphia Fire Underwriters' Association,

CHAS. A. HEXAMER, Secretary,
131-141 South Fourth Street, 6th floor,
(Electrical Department)

We desire inspection of electrical equipment on premises:

Located .....

Located as rated .....

.....

Occupied by .....

Floor .....

For .....arc lamps .....incandescent lamps ..... c. p.

For .....Nernst lamps.....Glower.

For .....Tungsten.....Wattage.....High Efficiency.....c. p.

For .....signs.....(Give number of lamps in each sign, also low voltage Transformer location).....

.....motors and generators.....h. p.

Miscellaneous (see other side.)

.....

.....

.....

MAKE OF WIRE.....

If changes, give full detail report—see other side.

UNDERSCORE CHARACTER OF WORK.

Concealed Knob and Tube. Conduit Moulding Open Work
Original Installation. Extension. Repairs

Location of Cut-outs.....Size of Feeders.....Mains.....Branches

Current to be from.....

Work to be started.....to be finished.....

Referred to Inspector.....Date.....

FIXTURE WORK.
(ATTACHING OF FIXTURES ONLY.)

Combination.....Straight Electric.....Name of Insulating Joint.....

.....*Contractor*

(*Address*).....

[OVER]

NOTICE. APPLICANTS MUST FILL IN FULL ALL ITEMS WHICH REFER TO WORK DONE, BOTH WIRING AND FIXTURE. APPLICATIONS WHICH ARE INCOMPLETE WILL BE RETURNED TO APPLICANTS.

Fig. 1.—Application for Inspection.

Amount of fee paid .....

Amount of fee charged .....

Philadelphia Fire Underwriters' Association
ELECTRICAL DEPARTMENT
Inspectors' Notice and Report File No. .....

Received .....191..... Application No. .....

Referred to Inspector ..... Date .....191....

Located .....

Location as rated .....

.....

Occupied by ..... Floors .....

For .....arc lamps ..... incandescent lamps ..... C.P.

For .....Nernst ..... Glower ..... High Efficiency ..... C.P.

..... motors-generators ..... H.P. ..... Tungsten lamps ..... Watts.

For .....Signs ..... (Give number of lamps in each sign, also low voltage transformer location.) ..... Tungsten lamps ..... Watts.

Alterations and repairs .....

Miscellaneous .....

.....

Fixtures—Combinations, straight electric Receptacles ..... Capacity .....

CHARACTER OF WORK (UNDERSCORE)

Concealed. Knob and tube. Conduit. Moulding. Open work. Original installation. Extension.

Make of wire .....

Temporary work. Yes. No. Previously approved record void. Yes. No.

Location of cutouts ..... Size of Mains ..... Branches .....

Current to be from ..... Work to be started ..... to be finished .....

Contractor ..... Address .....

Re-allotted .....

Temporary certificate issued, covering .....

.....

.....

.....

Permanent Certificate No. ..... Disposition made of Temporary Certificate ..... Expiring .....

(If Temporary) Date of expiration .....

Temporary Rough Wiring Fixture } Certificate No. ..... Date issued .....

Inspector.

Fig. 2.—Form of Inspector's Report.

ment. After the cashier has completed his record of the applications, they are immediately sent to the Electrical Department.

The inspectors who report at the office in the afternoon telephone the office in the morning and are advised of the applications that have been allotted to them. By this means the greatest number of installations are inspected on the same day the application is received. This allotment is preliminary to the formal allotment, as represented by the inspectors' notice (Fig. 2).

Applications are then taken care of by the record clerk, who places his stamp thereon. The applications are then referred to the rating cabinet and the maps with a view of verifying and correcting the location as stated in the application. As each risk, on which there is a record of electrical equipment, is assigned a different file

This article describes the methods and record forms used in electrical inspection by the Philadelphia Fire Underwriters' Association, of whose Electrical Department the author is director. He is also vice-president of the National Association of Electrical Inspectors. A number of the forms used are reproduced.

number and correspondingly numbered folder, in which all the records on that risk are filed, the importance of securing the correct and complete location of the risk is so evident, that no effort is spared in looking up the location, before the file number is assigned. In this way the possibility of having two different file numbers and folders on any one risk, is reduced to a minimum. After the record clerk is satisfied that the location is complete, by means of this investigation, he refers the application to the Certificate Record Cabinet, in order to ascertain if there is a record of an electrical equipment previously installed in the risk, and, if such be the case, to note the file number on the application.

The Certificate Record Cabinet is a cabinet containing a card record of every electrical certificate which has been issued by the Department, and of equipments in course of installation. The record cards are filed according to location, with reference to street and number of the risk. The method or order of filing the cards is: (1) Corner locations, these being arranged alphabetically; for instance, the card for Broad and Arch Streets would precede the card for Broad and Diamond Streets. (2) The odd street numbers. (3) The even numbers, these being separated from the odd numbers by a guide card marked "Even Numbers." If a building has several locations, cross-reference cards are filed under each location, referring to the principal location. For instance, the record for the risk located at 700 Market Street, 2-6, South Seventh Street, Southwest corner Seventh and Market Streets, would be found under 700 Market Street. A cross reference is filed under the location 2-6 South Seventh Street, giving the file number and stating "See 700 Market St." In the same way a cross-reference card is filed under the corner location, under South Seventh Street, giving the file number and stating "See 700 Market St." With this method it is possible to locate the record on a risk no matter under which one of its several locations the inquiry or application is received. With further reference to corner locations, it may be well to state that in order to save time, a definite rule is observed as to which one of the two streets the card is filed under. For instance, the card for Broad and Diamond Streets is filed under Broad Street as the letter "B" precedes the letter "D" in the alphabet. In the same way, if one of the two streets is a numeral street, such as Seventh and Market Streets, the card is filed under Seventh Street, being the numeral street, which is given the preference in filing. Special stress is laid upon the method of filing cards, to show every precaution that is taken to guard against the possibility of failing to find the previous record when looking up an application, and in this way assigning another certificate and file number to a risk and thereby separating the record. The above method also facilitates answering queries regarding any risk, as the complete record on that risk is located with dispatch and certainty.

If, on referring to the Certificate Card Cabinet, the record clerk does not find a previous record, he assigns a new file number to the risk, making up a card which contains the location and file number. A supply of these cards is numbered consecutively by means of an automatic stamp, thereby making it impossible to duplicate the file numbers. The clerk then files the card in the Certificate Record Cabinet, and in this way verifies the accuracy of the investigation.

If there is a record in the Certificate Record Cabinet on the risk for which inspection is desired, the file number found on the card is noted on the application. The contents of the folder are then examined, and any reports which have not been closed out are attached to the application. The inspectors' notices are then made out. Postal cards (Fig. 3), one addressed to the applicant and one to the public service corporation, are filled out. These postal cards are spaced off in such a manner that there is small liability in confusing numerals or alphabetical indications. Postal cards give date, file number, date of request of inspection, date of inspection, location of consumer, class of equipment and wireman's name. If the installation is for light only the inspector marks off the word "power" on the postal card, and *vice versa*. If both light and power are used, the postal card is not disturbed in that respect. The object in this feature is that an inspector sent by the public service corporation will know just what to fuse for, as there may be instances in which an application is made for both light and power, and only one of the equipments approved, the other being defective. The name of the wireman is also given as a matter of record for the public service corporation. The numerals used are arranged in a small pamphlet known as the "Electrical Key" (to be explained later). These numerals call the attention to certain defects and requirements which experience has shown to be largely misunderstandings or violations of the Code. Further-

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION
131-141 SOUTH FOURTH STREET
EIGHTH FLOOR

ELECTRICAL DEPARTMENT

PHILADELPHIA.....

In reply refer to File No......

In accordance with request of.....inspection was made of the electrical equipment installed by you in premises located .....(Date).....191

See KEY

Location of assured.....floor.

Installation Lt. and Pr.....

Wireman's name .....

Yours truly,

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION.

Form 368. 10M. 11-12-n

Fig. 3.—Postal Card for Immediate Report.

more, by use of the postal card and the Key, the inspector can in a moment place the numerals on the postal card, dropping same in the first post box which he comes to, thus quickly advising the installer or contractor of the result of an inspection, as for instance, if key "L" is placed on a postal card it would indicate certificate issued for introduction of current. If key "W" was placed on the postal card it would indicate certificate issued for lighting equipment only, power equipment defective. If key "X" is used, it would indicate power equipment O. K., lighting equipment defective. By this means quite often a contractor is advised of the result of an inspection on the day on which the application is filed. This affords him a ready opportunity to make corrections the same day and advise the Inspection Department to that effect in the first mail of the following morning. The inspector is notified immediately and revisits the risk to ascertain if corrections have been properly made. If so, certificate (Fig. 4) is issued. If otherwise, the contractor is again advised of existing conditions. To carry out this feature of the work, every electrical contractor and all their employees are furnished gratis with a copy of the Electrical Key, and to further promote the efficiency of the Department, inspectors and contractors are requested to make suggestions to be added to the Key, which in their judgment would be helpful to them in their work. The postal cards are attached to the inspector's notice and placed in the inspector's individual compartment in a cabinet provided for that purpose, each inspector having a separate compartment indicated by a name plate, provided for outgoing work. The postal cards are mailed by the inspector, after filling the space "Key ——" immediately after making the inspection. By this means the contractor and public service corporation are advised immediately of the result of an inspection.

After the Inspector's Notice is made up, the Suspense Card is made up. This card, which is practically a condensed copy of the application and inspector's notice, is filed in the Inspector's Allotment File, under the date on which the inspector received the notice. Each inspector has a separate allotment file, which consists of date cards. This file enables the office to check up the inspector's work, one day being allowed in which to make an inspection, and prevents the inspector from overlooking an order for inspection. The file is gone over daily and note is made of any cards remaining in the file for one preceding day, and the inspector is requested to make an immediate report on the overdue allotments, giving a reason for the delay. If the occasion for the delay is due to an unusual amount of work in an inspector's district, the matter is immediately called to the attention of the chief of the department. One or two inspectors who are known as floating men are immediately assigned a portion of the work in the overcrowded district, in order that the work may be immediately cleared up. The inspectors, after making up their reports (Figs. 2 and 5) place them in their individual compartments in the cabinet provided for Incoming Work, from which they are taken by a clerk, who counts them and checks the number of reports with the Daily Report (Fig. 6).

The clerk then removes the Suspense Cards for these reports from the Suspense File (which is a cabinet containing all cards filed on work in course of installation), the cards being found in the Allotment File or in the Progressing File (explained later). There should be a card for each report.

The character of the reports will permit of the following classification:

(1) Finished work.

(2) Rough wiring O. K. and other reports on which no letters need be written and which do not require following up, due to the fact that the contractor has been advised by the postal card system previously referred to.

(3) Reports on work in progress.

(4) Reports on defective work and other reports which require letters and following up.

We will describe the treatment given each class, in its order.

The Suspense Cards for the reports on finished work for which certificates are to be issued, are removed from the suspense file, stamped Electrical Certificate Issued (date), and filed in a date file under the date on which the certificates were issued. This constitutes the Receipt Follow-up File, which will be described more fully later. The reports are referred to the Certificate Record Cabinet, for the purpose of ascertaining if there is a previous record on the risk. If such be the case, and the installation is consequently an extension of an existing equipment, the certificate number found on the card in the cabinet is noted on the report, and notation of the certificate about to be issued is made on the card. This notation consists of the date, equipment, floor and application number. If the installation is original, or if it is a risk not previously having had approved electrical equipment, a new certificate number is placed on the card. Notice is also made of the approved equipment, date of issuing of certificate, floor and application number. After all the reports on finished work are referred to the Certificate Record Cabinet, certificates are made out. The numbers for new certificates are arranged consecutively and placed in a book provided for that purpose, thus preventing the duplicating of numbers. When a certificate number is once assigned

Form 143-12500-1-14-6

Application No......

File No......

Date *191*

Location.....

.....

.....

.....

.....

.....

TEMPORARY APPROVAL. Application No..... File No.....

PHILADELPHIA,..... 191

The Philadelphia Fire Underwriters' Association,

Both Phones. 131-141 SOUTH FOURTH STREET. (Eighth Floor.)

Certifies, That the Electric Equipment in premises

Located .....

For.....

On .....

as far as completed is installed in accordance with the Rules and Requirements, and is approved, and the use of electric current is permitted. This approval is good until.....

CHAS. A. HEXAMER,
Secretary.

.....
Inspector.

☞ **PRESENT THIS CERTIFICATE TO THE LIGHTING COMPANY FURNISHING CURRENT**

Fig. 4.—Temporary Certificate of Approval.

Form 23b. 1915-10-10-5

PHILADELPHIA FIRE UNDERWRITERS' ASSOCIATION

ELECTRICAL INSPECTORS' REPORT ON WORK IN PROGRESS

*File No.*_____

*Date of Inspection*_____ 19__ *Date Received*_____ 19__

*Location*_____

*Occupied by*_____

(Underscore Character of Work)

Concealed. Knob and Tube. Conduit. Moulding. Open Work.

Installation in what stage, or if not as reported, what additions, if any, conditions or defects.

Rough concealed wiring O. K., not lathed. Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Progressing in accordance with National Elec. Code. Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
No change. Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Finished as applied for, or Basement, 1st, 2nd, 3rd, 4th, 5th, 6th, 7th.
Building Locked. Time_____
Work not started
Remarks: _____

Inspector.

Fig. 5.—Report on Work in Progress.

to a risk, all subsequent certificates bear the same number, hence the importance of keeping the numbers consecutive. The certificates are then typewritten. Two carbon copies of the certificates are made. The brown copy is so worded as to constitute a notice to the public service corporation supplying the electric current that the certificate has been issued. This notice is sent to the public service corporation on the same day the certificate is issued. The white carbon copy is so worded as to constitute a receipt, and is sent to the electrical contractor with the certificate, to be signed and returned to the Inspection Bureau.

After the certificates are made out, to avoid the liability of an error, they are checked with the reports by two clerks, one clerk reading the report and the other noting the correctness thereof on the certificate. If the report and certificates compare, the clerk handling the certificate places his initial thereon. The object, of course, in placing initials on certificates is to fix the responsibility in the event of an incorrect certificate leaving the office. If an error is found on a certificate, a new one is made out, erasures and corrections not being permitted on certificates. The certificates are then passed to the chief of the Department for signature. In his absence the signing of certificates becomes the duty of the chief clerk of the Department, who signs the chief's name, per his own. The certificates

Philadelphia Fire Underwriters' Association.

ELECTRICAL DEPARTMENT.

INSPECTOR'S DAILY REPORT.

Inspectors will report daily the orders in their possession two days, also the number of visits made and reports completed each day.

File	Location	Date Allotted	Cause of Delay

NEW WORK		SPECIALS		RE-INSPECTIONS		USELESS VISITS			
Reports Written	Risks Visited	Reports Written	Risks Visited	Reports Written	Risks Visited	Building Locked	Work Not Completed	Refused Inspection	Other Causes
									State on opposite side of blank "OVER"

*Date,*_____ *191* _____ *Inspector.*

OVER

Fig. 6.—Inspector's Daily Report.

are then mailed, usually to the applicant for inspection, together with the receipt.

Reports on installations which are temporary and for which temporary certificates are to be issued, are so noted by the inspector. The temporary certificates are then typewritten, one carbon copy being made. This copy is a notice to the public service corporation that the temporary certificate has been issued and is mailed to it. The temporary suspense card for the report on which the certificate is issued, is noted as to date of expiration of the certificate, and is filed in a date follow-up file under the date on which the temporary certificate expires. This file is known as the Temporary Certificate Follow-up File. The card in the Certificate Record Cabinet is noted as to date, expiration, equipment, floor and application number. The certificate numbers for temporary certificates are consecutive, irrespective of any other certificate number applying on the risk. The temporary certificates are checked with the reports by two clerks, one clerk reading the report and the other noting the correctness thereof on the certificate. If the report and certificate compare, the clerk handling the certificate places his initial thereon. The object, of course, in placing the initials on certificates is to fix the responsibility in the event of an incorrect certificate leaving the office. The certificates are then passed to the chief of the Department for signature. In his absence the signing of certificates becomes the duty of the chief clerk of the Department.

Rough Wiring O. K.

The reports on installations of this character are entered on the Suspense Cards. As these reports do not require following up of any kind, the Suspense Cards are filed in the Certificate Record Cabinet, directly in front of the record card on that risk. If these cards are required in the future for following-up as, for instance, on receipt of the application for inspection of fixtures, the card is removed at the time the application is looked up in the Certificate Record Cabinet, and attached to the application, and subsequently attached to the new Suspense Card made out for the fixture application. Or, if final inspection of the rough wiring or other condition is requested, the card is removed from the Certificate Record Cabinet, and again becomes active in the file for work in course of installation. The reports on conditions of this class are then submitted to the chief clerk, who selects those reports on which Rough Wiring Certificates and Fixture Certificates are to be issued. *(To be continued.)*

New Electrical and Mechanical Appliances

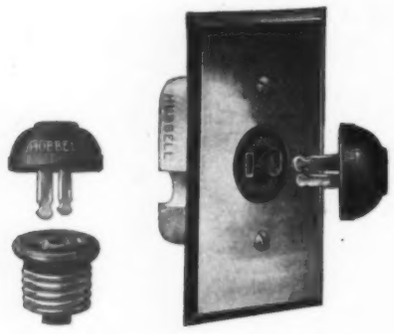
Polarized Attachment Plug and Receptacle.

In many cases buildings are equipped with both alternating-current and direct-current circuits, the latter being required for some special purposes for which direct-current apparatus is particularly suitable. In such cases a distinctive means of determining between the two types of outlets has been found very desirable.

This function can now be very satisfactorily performed by means of a new line of polarized attachment plugs and receptacles, both of the surface and flush types. In the accompanying illustrations are shown a small separable polarized plug and a polarized flush receptacle; these two devices are characteristic of this new line of equipment, which is manufactured by Harvey Hubbell, Incorporated, Bridgeport, Conn.

The polarized feature is obtained by making one of the knife-blade contacts smaller than the other, both in length and width; one slot in the base is likewise proportionately reduced. As the opposite blade is of the standard size it cannot be inserted into the small slot, thus making it imperative to insert the cap in the base in only one way, which is the right way. By this means correct polarity is absolutely assured at all times. This variation in the length of the contacts is also found of assistance in making rapid connection, as by rotating the cap the longer blade is led into the proper slot by means of the bevel edge and at the same time the opposite blade is automatically engaged.

The cap for this new type of polarized plug can be interchanged not only with the complete line of polarized receptacles but also with the entire line of T-slot wall and flush receptacles made by the Hubbell firm. The concealed-contact feature which distinguishes all Hubbell plugs is retained in this new line of polarized devices, thus commending it to those who desire electrical safety.



Polarized Plug and Receptacle.

Patented Three-Volt Dry Battery.

In place of the usual six-inch 1.5-volt dry cell used in the hand lamps now on the market, the Interstate Electric Novelty Company, 29 Park Place, New York City, has been granted letters patent on a three-volt battery of the same size and shape which gives twice the light and is claimed to last four times longer than the ordinary dry cell. With this battery the average hand lamp and bicycle lamp gives an exceptionally bright light which has so far not been equaled. The new battery is called the "Radio Nitrogen Battery" and has proven very popular. Numerous infringements and inferior imitations have already appeared on the market. The company states that injunctions will be sought against all imitations.

The accompanying illustration shows the new battery. Its interior arrangement was shown on the patent pages of our December 4 issue.

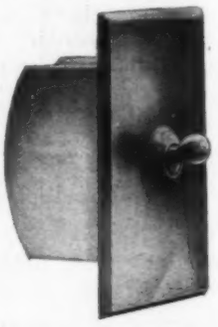
Three-Volt Dry Cell.

Portable Tuner for Wireless Devised by Boston Experimenters.

What promises to be an important advance in the development of wireless apparatus has been achieved by Henry C. Gawler, Boston, and Herbert M. Hammett, Roxbury, Mass., who have gained some very interesting and satisfactory results by the use of an exceptionally compact tuner. By the employment of this device, which is portable and can be contained in a box about 12 by 16 by 18 inches, and by the use of a comparatively small antenna, which may be only about 225 feet long and not over 50 feet high, and consists of two wires, these operators have been able to receive from radio stations at Nauen and Eilvese, Germany, either by day or by night.

The Newton Toggle Switch.

A new type of wall switch with an attractively artistic face plate has been put on the market by the Newton Manufacturing Company, Lynbrook, N. Y. This switch is known as the Newton toggle switch. It is operated by a simple, but reliable, toggle mechanism, of which the projecting operating lever needs merely to be tilted up and down. This method of operating has been found very popular in England, but heretofore no practical attempt has been made to introduce it here.



Newton Toggle Switch.

A distinctive feature of this switch is that its face plate is free from fastening screws. It is also small and neatly finished, the projecting lever corresponding with the face of the plate. The standard plate is rectangular in shape, as shown; circular and elliptical plates can also be used.

This type of switch is made single and double pole, also as a three-way or four-way switch. It is suitable for all classes of service, but because of its handsome appearance it is peculiarly appropriate for residences, apartments, and other buildings where every feature of the interior finish has been carefully thought out by the architect or owner.

Big Increase in Lifting Capacities of Cutler-Hammer Lifting Magnets.

Since the feat of salvaging the boat load of barbed wire and nails from the muddy bed of the Mississippi River accomplished by Cutler-Hammer magnets in 1907, no important change has occurred in lifting-magnet design. The Cutler-Hammer Clutch Company, Milwaukee, Wis., is now, however, announcing a new series of magnets of the same rugged and water-tight construction but having lifting capacities ranging from 20 to 60 per cent greater than before. The lifting capacity, for instance, of the 62-inch magnet as given up to the present was about 2,600 to 3,000 pounds, but now this is increased to 4,000 and over. This increase in the lifting capacity allows the handling of more material in the same time or the same amount in shorter time. It also reduces the number of magnets, cranes and crane operators needed, since in many cases two of the new magnets can do the work formerly done by three. The fewer trips a magnet must make, the fewer times its dead weight must be lowered, raised and conveyed, the more efficiently and quickly the material can be handled. Because of the labor shortage and the demand for speed at the present time the increased capacities are of particular importance.

The Cutler-Hammer Clutch Company has had this type of magnet in use and on test for nearly three years before standardizing. It is now claimed that the lifting capacities of Cutler-Hammer magnets are greater in proportion to magnet weights than for any magnet ever made.

Cutler-Hammer Lifting Magnet of New Design.

Leeson-Universal Electrical Coil-Winding Machine.

In the design of electric coils, whether for electromagnets, transformers, fields, or other purposes, it is desirable to obtain sufficient mechanical strength in the body of the windings themselves so that these form a self-sustaining unit independent of any core, spool, bobbin or other framework on which they may be wound. If such strength is obtained, the coil has a very much greater factor of safety against rupture from the violent mechanical stresses due to short-circuits or excessive currents; it is also better able to withstand handling in assembling or repairing the apparatus in which the coil is used.

By means of a system of cross winding in which the successive layers cross at an angle, considerable inherent mechanical strength is obtained. Many coils, however, are not adapted to such a winding and require that all turns be substantially parallel. To meet the need for greater strength of such coils there has been perfected a special system of winding known as the Leeson-Universal winding system. This is accomplished entirely automatically by means of the compact machine shown in Fig. 1. This machine has a number of adjustments by means of which the coil dimensions can be readily varied, as well as the nature of the intermediate layers of cotton yarn which serve to cross bind the turns of each successive layer of wire.

In this system each layer of wire is put on with its turns closely side by side as on a spool of thread. On top of each layer of wire there is wound a layer of cross windings of cotton. The arrangement of these layers depends upon the use for which the coil is being wound. In many cases it is grouped as shown in Fig. 2, where the cotton cross windings are wider and wider as the right end of the coil is reached; on top of the next layer of wire is applied another similar cross winding of cotton, but in this case the groups of cotton turns are wider at the left end than at the right end. This alternation is repeated between the successive wire layers until the coil is complete. On the outside of the coil a layer of protecting cotton may be uniformly cross wound, as shown in Fig. 3, or left in the manner shown in Fig. 4 on next page.

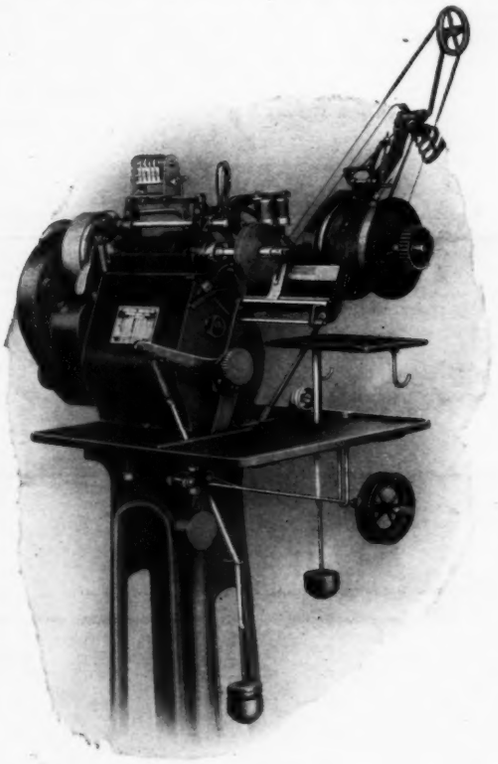


Fig. 1.—Leeson-Universal Coil-Winding Machine.

Fig. 2.—Coil Wound on Leeson-Universal System.

An important feature of this winding machine is that it winds on the cotton layers simultaneously with the wire layers, the mechanism being ingeniously contrived to avoid interference. The extreme edges of the cotton layers are wound a little beyond the edges of the wire layers, thus affording a cushion protection to the ends of the coil.

Coils wound by the process have electrical advantages as well as additional mechanical strength. The arrangement of the cotton layers, although these are of very fine yarn, makes an extra amount of insulation at the ends of the coils, which is graded toward the middle, thus providing most insulation where the potential stresses between adjacent layers are greatest. The cotton layers also provide crevices between the wire layers which promote the thorough impregnation of the coil, if insulating compounds are to be applied. The coil is also made elastic against sudden stresses. These coils may be wound in cylindrical, ring or rectangular form.

Fig. 3.—Leeson-Universal Field Coil.

Fig. 4.—Leeson-Universal Meter Coil.

The machine shown in Fig. 1 is capable of winding coils not exceeding 3.25 inches long and 5 inches in diameter, using wire not larger than No. 20 B. & S. gauge. These machines are made by the Universal Winding Company, 95 South Street, Boston, Mass.

Haynes Stellite Company to Install Snyder Furnace.

The Haynes Stellite Company of Kokomo, Ind., has placed a contract with the Snyder Electric Furnace Company, Chicago, for a 1.5-ton per 24-hour electric melting furnace. The furnace has an eighth ton holding capacity, 50 kilowatts input and will produce 12 heats per 24 hours. The Haynes Stellite Company is the manufacturer of the cutting alloy Stellite which has been making a number of remarkable records during the past two or three years.

New Self-Starter for Small Direct-Current Motors.

A new self-starter for small direct-current motors in sizes one-half to three horsepower, 115 and 230 volts, has been designed for constant-speed, machine-tool or similar service where frequent starting is required. The starter consists of a line switch, line contactor, accelerating contactor and resistance. These units automatically regulate the speed of acceleration and open the circuit in case the voltage fails. Fuses protect the motor against overload.

The switch is totally inclosed in a cast-iron case and is arranged with certain safety features which protect the operator from injury. The cover over the switch parts can be opened only when the line switch is open. The line switch, operated by a lever outside of the case, can be closed only when the cover is shut. In addition, the cover can be locked shut or the switch can be locked open.

Self-Starter for Small Motors.

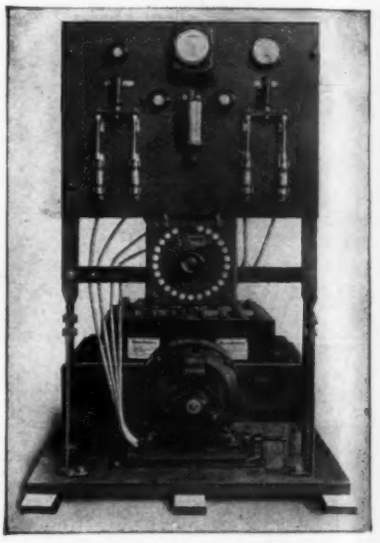
The new starter can be operated by push-buttons located at convenient points or by the line-switch handle on the right-hand side of the starter. It is manufactured by the General Electric Company, Schenectady, N. Y.

Rural Lighting and Power Plant.

Electricity need no longer be classed as a luxury obtainable only by those living in thickly settled communities reached by central-station circuits. The little generating plant illustrated herewith makes it possible for anyone on a farm or country place to enjoy the conveniences of electricity for lighting, heating and power purposes, no matter how far removed from power lines he may live. They are useful in country homes, on farms, and in small manufacturing establishments in rural districts where they furnish power for lights, for operating fans, vacuum cleaners, sewing machines, washers, heating appliances and motors driving pumps and small farm machinery.

The plant illustrated consists of a Westinghouse low-voltage generator and control panel and a Hyray-Exide storage battery, all of which are mounted on skids, rendering the outfit portable. The generator may be driven by any ordinary oil, gas, or gasoline engine or, if water power is available, it can be used and the electricity will cost practically nothing.

The operation is simple. The generator is driven by an engine and the current is either expended directly or else accumulated in the storage battery for use at some future time. An automatic switch on the control panel maintains a steady voltage on the battery when charging, and an ampere-hour meter shows at all times the exact amount of reserve energy in the storage battery and indicates when to start and stop the charge.



Rural Electric Plant.

The outfits are sold complete without the engine by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. They are made in various sizes to suit different conditions. The battery is fully charged when shipped and is ready for immediate use.

New Fire Alarm Station for San Francisco.

A new central fire-alarm station has recently been put in service at San Francisco, Cal. It is located in the center of Jefferson Square, a public park, so as to be free from the danger of any possible general conflagration, such as that which visited the city in 1906. The cost of the structure and equipment was $85,000.

Current Electrical News

ATLANTIC STATES.

BUFFALO, N. Y.—Plans are being made by the Buffalo General Electric Company for the erection of a $1,500,000 plant for the generation of electricity by steam.

PAULSBORO, N. J.—Harrison & Brothers, of Philadelphia, will erect a large brick and concrete manufacturing plant here. The owners will take bids at their headquarters, Thirty-fifth Street and Gray's Ferry Avenue, Philadelphia, Pa.

PHILADELPHIA, PA.—Clarence H. Geist, of Philadelphia, president of the Northern Indiana Gas and Electric Company, has purchased the holdings of the Indiana Lighting Company, which supplies power, light, gas and water to twenty Indiana and Ohio cities. The company is capitalized at $4,500,000. G.

PHILADELPHIA, PA.—A three-story brick and stone addition will be made to the courthouse at Twenty-first and Race Streets by the City of Philadelphia. The electrical equipment will be complete. J. T. Windrim, Philadelphia, is the architect.

PHILADELPHIA, PA.—The S. B. & B. W. Fleisher Compar·· will shortly erect a $1,000,000 five-story brick and concrete factory building at Twenty-sixth and Reed Streets here. William Steel & Son Company are the architects.

MASON, W. VA.—The Ohio River Salt Company will install an electric ligh plant on its property.

NORTH CENTRAL STATES.

LOWELLVILLE, O.—The Stone & Webster Engineering Corporation has recently started work on an extension to the Lowellville power station at Youngstown, O., for the Republic Railway and Light Company. The following summary briefly describes the new work: Turbine and boiler rooms, four bays, brick and structural steel with reinforced concrete floors and roofs; five 600-horsepower Babcock & Wilcox water-tube boilers with superheaters and stokers, one forced draft fan and engine; one 15,000-kilowatt, 2,300-volt, General Electric turbo-generator; one 200-kilowatt combination motor and turbine-driven exciter set; three 3,125-kilovolt-ampere General Electric step-up transformers; one 1,000-gallon capacity feed pump, condensing equipment, separate screen well and intake tunnel; coal bunker for full length of the boiler room, ash hoppers, coal gates, chutes, tracks, etc. The original station of 15,000 kilowatts capacity was designed and built by the Stone & Webster Engineering Corporation in the summer of 1912.

DETROIT, MICH.—The State Railroad Commission has approved an issue of $3,500,000 short-term, five per cent trust notes by the Detroit United Railways. Of this about $500,000 will be used for street-railway extensions and betterments; the remainder will be used to retire securities about to mature.

BYRON, ILL.—The Byron Electric Light and Power Company has incorporated. The company's capital stock is $15,000, and it is to furnish electric current for public service. William H. Vanston, Thomas M. Hench, Willa H. Dillon, George W. Sherman, A. Roy Mize, Lester D. Beitel and James C. Woodburn are the incorporators. Z.

MACOMB, ILL.—Plans for the establishment of a municipal electric light plant are being discussed by the city council. Mayor S. B. Dawson is leading the movement. Z.

MONTICELLO, WIS.—Bonds have been issued for $12,000 for municipal electric light plant. Address Dr. Edward Blumer, mayor.

GUTTENBERG, IOWA.—The citizens have voted to establish a municipal light system. Address city clerk.

CIRCLEVILLE, KANS.—Bonds have been voted for the erection of an electric light plant. Address city clerk.

HAVEN, KANS.—The council plans to improve street lighting in Haven. Address town clerk.

CORTLAND, NEB.—A. J. Goodban will install an electric light plant.

DIXON, NEB.—Bonds have been voted for an electric light plant. Address town clerk.

ABERDEEN, S. D.—The installation of additional machinery is necessary before the electric company can furnish more lights. Address town clerk.

SOUTH CENTRAL STATES.

CYNTHIANA, KY.—The Kentucky Utilities Company, Lexington, Ky., will install additional generating equipment in the local plant to provide 24-hour service. G.

MT. OLIVET, KY.—The Mt. Olivet Light and Power Company is buying equipment for an electric light plant to develop 40 horsepower. The machinery needed includes an oil engine, alternator and supplies. G.

KNOXVILLE, TENN.—The city of Knoxville, Tenn., will receive bids until December 31, for furnishing the city not less than 600 arc lights, and lighting city buildings. Address Robert P. Williams, recorder and secretary.

NASHVILLE, TENN.—The Nashville, Chattanooga & St. Louis Railway will purchase electrical power equipment for the operation of coal-handling machinery at Cowan, Tenn.

HEAVENER, OKLA.—The city of Heavener will not build a new municipal plant as authorized recently when voters approved an issue of $20,000 bonds. Instead, the city will proceed to purchase the Heavener Light and Power Company's plant. A purchase price of $9,325 has been agreed upon. The city will spend $6,000 for improvements.

DALLAS, TEX.—Active construction work has been started on the new eight-story Interurbanu Union Terminal Station for Dallas, which will be built on Jackson and Browder Streets. Contract for the excavation work has been let and the work will proceed as rapidly as possible. The station will be a terminal for the Northern Texas Traction Company, Texas Traction Company, and Southern Traction Company, interurban lines running from Dallas to Fort Worth, Denison, Corsicana and Waco. The Dallas Electric Light and Power Company, the Dallas Consolidated Street Railways Company, the Southern Traction and Texas Traction Companies and the Texas Power and Light Company will occupy offices in the new building when completed. This station will be one of the most up-to-date in point of construction of any in the entire country. The work is being done by the Stone & Webster Engineering and Construction Company.

DALLAS, TEX.—A plan is under way to change the entire street lighting system in Dallas in accord with recommendations being made by City Electrician Leon Taylor. It is proposed to increase the number of units installed and decrease the size and distance apart.

SAN ANGELO, TEX.—The Interstate Electric Company, which owns the local electric light and power plant, is considering the construction of a street railway system here. J. D. Sugg, owner of the existing system of street railway, recently offered to give the property to the city as a free gift, but the tender was refused. He claims that it is unprofitable to operate it. It is stated that it will probably be either taken over by the Interstate Electric Company and the lines extended, or the latter company will build an entirely new system. D.

WESTERN STATES.

HARDIN, MONT.—The Big Horn Irrigation and Power Company, according to J. J. Harris, of Hardin, president of the company, will construct and operate a large power and irrigation project on the Big Horn River, and will make the following improvements; 415-by-1,000-foot dam, 400 feet thick at base and 30 feet at top; power plant of 170,000 horsepower capacity; railroad from Custer, Mont., to Billings, to cost $800,000; ditches, laterals, etc.; total cost is estimated at $12,000,000. O.

SCOBEY, MONT.—It is stated that the Scobey Electric Light Company is planning to enlarge its plant at this place.

LIBERTY, COLO.—The city council has under consideration the installation of a municipal electric light plant. Address the city clerk. U.

LIMON, COL.—Application has been

made to the City Council by W. J. Cowhick, Pueblo, for a franchise to install and operate an electric-light plant in Limon.

FLORENCE, ARIZ.—An electric power transmission line will be built from the Salt River Government plant to Florence and the surrounding district. D.

WALNUT GROVE, ARIZ.—Mrs. Eleanor Whitman, of Philadelphia, Pa., has had plans prepared for a reinforced concrete dam which she will build across the Hassayampa River near here, and the construction of a hydroelectric plant, at an estimated cost of one million dollars. The reservoir to be created by the proposed dam will afford a water supply for irrigating 17,600 acres of land. Fred Dennett, of Phoenix, Ariz., is Mrs. Whitman's representative in the project. D.

RENO, NEV.—The city council has plans under consideration for the installation of electroliers in the downtown district and the gradual extension of the system into the residential districts. The plans call for eight lights to the block.

WENDELL, IDAHO.—The installation of an ornamental electric lighting system is being considered by the council, and it is understood plans for the improvement are under preparation.

LANGLEY, WASH.—The proposition of issuing bonds to purchase and extend both the electric light and water systems in operation in this city will be placed before the voters by the town council. O.

OKANOGAN, WASH.—Plans have been completed for the extension of lighting and power lines along the Okanogan River by the Okanogan Valley Power Company, between Malotte and Okanogan, current to be supplied for lighting and irrigation purposes. It is understood the Okanogan Company has negotiated a deal with the Government for one of the power plants owned by the Government in his section, which is now idle. The plant which will be employed has 300 horsepower capacity. O.

OLYMPIA, WASH.—Hugh L. Cooper, promoting the construction of power plants on the Pend O'Reille River, near Metaline Falls, has been granted overflow rights on shore lands on both sides of the Pend O'Reille River for a distance of about seven miles, from McInnis Mills to one mile north of Blue Slide, by the State Board of Land Commissioners at Olympia. The company which is represented by Cooper has also made applications for overflow rights for a distance of 12 miles from Ione to a point one mile north of Blue Slide, and if this application is granted, the company will have overflow rights to shore lands on both sides of the river for a distance of 40 miles, or practically the entire length of Pend O'Reille County. O.

PORT ORCHARD, WASH.—The Bremerton-Charleston Light and Fuel Company has applied to the commissioners of Kitsap County for a franchise to construct and maintain poles and wires over the county roads.

PROSSER, WASH.—A special election to vote bonds for the construction of a municipal power plant is being considered by the city council. The council proposes the construction of a power plant a few miles east of town, on the Yakima River. The Pacific Power and Light Company, holder of a 25-year franchise, now supplies Prosser and contiguous territory. O.

SEATTLE, WASH.—The council of Seattle is considering the submission of a $3,000,000 bond issue to the voters on March 7 next, the funds to be used for the purchase of an additional power plant. The purchase of an additional power project, payment to be made in utility bonds, has been considered by the council for some time, but Superintendent of Lighting J. D. Ross prefers that an extension of the lighting system, or the construction of an additional power plant, come before the people and be officially authorized by them. O.

LA PINE, ORE.—According to reports, the Pringle Falls Water and Power Company of this city, maintaining offices in Portland, Ore., was recently sold to a syndicate of eastern capitalists, which is headed by Thomes Bros., of Nebraska. Reported consideration was $300,000. The company plans supplying power for the irrigation of the entire La Pine Basin, Eden Coulee, Silver Lake and Fort Rock Valleys. O.

RICKREALL, ORE.—The Oregon Power Company, of Dallas, A. L. Martin, manager, is considering the extension of the electric transmission lines to serve Rickreall and vicinity. It is understood work on the extension will be started shortly after the first of the year. O.

BERKELEY, CAL.—Steps have been taken here toward lighting the city under a district plan. The city council has approved specifications for lighting a district including everything south of Derby Street and east of College Avenue, and plans for the creation of another district to take in the region north of the University of California campus are being prepared.

CALEXICO, CAL.—The city has signed a contract with the Holton Power Company for the establishment of a street lighting system. Plans call for six 600-candlepower lights, fourteen 400-candlepower, and twelve 250-candlepower lamps.

GILROY, CAL.—The Coast Counties Gas and Electric Company has leased the local electric light plant and is to make improvements in the distributing system. A new electrolier system is to be installed on Monterey Street.

FOREIGN TRADE OPPORTUNITIES.

[Addresses may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch offices at Boston, New York, Atlanta, Chicago, St. Louis, New Orleans, Seattle and San Francisco. Write on separate sheet for each item and give file number.]

NO. 19,483. TELEPHONE APPARATUS.—A new telephone company is being formed in South America, and it is suggested that manufacturers of telephone apparatus suitable for long-distance work might be interested. Correspondence should be in Spanish.

NO. 19,491. ELECTRIC ENGINES.—A company in India informs an American consular officer that it desires to be placed in communication with manufacturers of small engines capable of being driven by electricity. The engines to be of simple construction and capable of developing five horsepower.

NO. 19,492. ELECTRIC FIXTURES.—A report from an American consular officer in Russia states that inquiries have been received for names and addresses of manufacturers of electric fixtures and appliances of all kinds, such as buttons, switches, fuses, lamp holders, and electric meters. Catalogs, samples, and conditions of sale are requested. Prices should be quoted c. i. f. Russian ports in Russian equivalents.

NO. 19,501. FIRELESS COOKERS.—A manufacturer's agent informs an American consular officer that he desires catalogs and full information from manufacturers of fireless cookers. Correspondence may be in English.

NO. 19,506. ELECTRICAL SUPPLIES, ETC.—A report from an American consular officer in France states that a firm in his district would like to be placed in communication with manufacturers of optical goods, clocks, sewing machines, and electrical supplies, with a view to becoming their agent. Correspondence should be in French.

NO. 19,512. ELECTRICAL SUPPLIES.—An American consular officer reports that a firm in France desires to be placed in communication with manufacturers of electrical supplies, and lamp shades made of metal and porcelain. It is stated that purchases will be made on cash basis. Correspondence should be in French.

PROPOSALS.

WIRING SYSTEM AND LIGHTING FIXTURES.—Sealed proposals will be received December 22, for installing a new conduit and wiring system and lighting fixtures at the United States postoffice at Dover, Del., in accordance with drawings and specifications, copies of which may be had at office of the custodian, Dover, Del. Address James A. Wetmore, Acting Supervising Architect, Washington, D. C.

NEW PUBLICATIONS.

ADVANTAGES OF CENTRAL-STATION SERVICE.—The Edison Edectric Illuminating Company of Brooklyn has issued a handsomely-printed booklet entitled "Edison Power Pays." This contains fac-simile letters from many large manufacturers of Brooklyn, with illustrations of their plants, the letters giving evidence of satisfaction with the Edison company's service. Among the companies using more than 1,000 horsepower are the following: American Manufacturing Company, E. W. Bliss Company, Bush Terminal Company, Flinn-O'Rourke Company, Luna Park, Manhattan Bridge Three Cent Line, Morse Dry Dock & Repair Company, New York Dock Company, Robbins Dry Dock & Repair Company, Steeplechase Park, W. H. Sweeney Manufacturing Company, and the Tidewater Paper Mills.

NATIONAL ELECTRIC LIGHT ASSOCIATION PROCEEDINGS. — The Proceedings of the Thirty-Eighth Convention of the National Electric Light Association, which was held at San Francisco, Cal., June 7-11, 1915, have been published in four volumes. One volume is devoted to reports of the general sessions, executive sessions, celebration exercises and public policy session; this volume being embellished by a portrait of Holton H. Scott, twenty-eighth president of the association. Another volume contains papers, reports and discussions of the hydroelectric and transmission sessions and the technical sessions. The third volume contains papers, reports and discussions of the

commercial sessions, and one volume is devoted to the papers, reports and discussions of the accounting sessions. The volumes are published by the order of the Executive Committee and the entire proceedings embracing over two thousand pages of text and some one hundred and thirty pages of indexes, have been compiled and edited by the secretary, T. C. Martin, and his staff, to whom credit is due for a most praise-worthy achievement. The printing and binding are well handled, as usual, by the James Kempster Printing Company, New York.

FINANCIAL NOTES.

There has been admitted to the regular list of the New York Exchange $546,000 additional first-mortgage five-per-cent gold bonds of the New York Railways Company due 1937, making the total amount of said bonds listed at this date $4,271,000.

Consolidated Gas, Electric Light & Power Company of Baltimore has called for payment on January 7, 1916, at par and accrued interest all its $2,500,000 five-per-cent two-year notes due March 15, 1917. The right to convert these notes into common stock of the company at 115 will cease January 3, 1916.

Standard Gas & Electric Company has sold to H. M. Byllesby & Company $500,000 twenty-year six-per-cent notes, which are being offered on a 6.75 per cent basis. These notes are part of an authorized $15,000,000, of which $2,000,000 have been previously sold, the $500,000 now being offered making $2,500,000 outstanding. The sale of this amount of notes will retire substantially all the short-time obligations of Standard Gas & Electric, including the $1,778,300 serial six-per-cent notes due June 1, 1916.

Dividends.

	Term	Rate	Payable
Am. Cities, pf.	S	1.5 %	Jan. 1
Am. Pub. Util., pf.	Q	1.5 %	Jan. 1
Bell Tel., Canada	Q	2 %	Jan. 15
Brazil Trac., Lt. & Pw., pf.	Q	1.5 %	Jan. 1
Capital Trac.	Q	1.25%	Jan. 1
Cen. Sts. Elec., pf.	Q	1.75%	Dec. 31
Consumers Pw., Mich.	Q	1.5 %	Jan. 1
Duluth-Sup. Trac., pf.	Q	1 %	Jan. 3
East Pw. & Lt., pf.	Q	1.5 %	Dec. 15
El Paso Elec., pf.	Q	$3.00	Jan. 10
Manila Elec. R. R. & Ltg. corp.	Q	1.5 %	Dec. 31
Mohawk Valley	Q	1.5 %	Jan. 3
Narragansett Elec. Ltg.	Q	$1.00	Jan. 3
Narragansett Elec. Ltg.	—	66⅔c	Jan. 3
New Orleans Ry. & Lt.	—	0.5 %	Jan. 1
New Orleans Ry. & Lt., pf.	Q	1.25%	Jan. 1
New York State Rys.	Q	1 %	Jan. 3
New York State Rys., pf.	Q	1.25%	Jan. 3
Ohio Trac. & Lt., pf.	Q	1.5 %	Jan. 1
Penn. Water Pw.	Q	1 %	Jan. 3
So. Util., pf.	Q	1.75%	Dec. 31
Springfield Ry. & Lt., pf.	Q	1.75%	Jan. 1
Sub. Bell Tel.	Q	2.5 %	Jan. 3
Toronto Ry.	Q	2 %	Jan. 3
Twin Cities Rap. Tran.	Q	1.5 %	Jan. 23
Twin Cities Rap. Tran., pf.	Q	1.75%	Jan. 23
Union Trac.	S	3 %	Jan. 1
West India Elec.	Q	1.25%	Jan. 1
West. Union Teleg.	Q	1.25%	Jan. 15
West. Union Teleg., extra	—	0.5 %	Jan. 15

PERSONAL MENTION.

MR. B. M. ATKINS has been appointed district manager for southwest Washington of the Northcoast Power Company, Vancouver, Wash., and the district office has been moved from Kalama to Kelso.

MR. W. F. HOOVER, of Nashville, Tenn., president of the Tennessee Power Company, was elected president of the Industrial Association of the South, at a recent meeting held in Nashville for the purpose of organizing the new body, the purpose of which is to advertise the resources of the Southern states.

MR. ELLIOT COWDIN, the American aviator with the French Army, sailed for New York on the *Rotterdam* last week, and will enjoy a brief leave visiting relatives in New York. Mr. Cowdin is one of the most daring and successful of aviators, and is a nephew of Mr. H. Durant Cheever, president of the Okonite Company, of New York.

MR. F. W. DARLINGTON, consulting engineer in electrical, mechanical and hydraulic undertakings, has moved his main office from Philadelphia, Pa., to Chicago, Ill. He has entered into a close working arrangement with the firm of Berry & Roberts, consulting civil engineers, and with Mr. A. G. Shaver, consulting signal engineer, whereby matters pertaining to the engineering of these undertakings may be jointly or severally handled.

MR. GEORGE B. WOODWARD, who has been connected with Fairbanks, Morse & Company for nearly fifty years, and who since 1899 has been manager of the Louisville, Ky., branch of the company, has retired from service, owing to his advanced age. His retirement was marked by a cordial evidence of appreciation on part of the company. His successor is Mr. J. F. Snarenberger, who has had the title of assistant manager at Louisville for the past six years.

MR. H. H. BURTON has resigned his position in the legal department of the Utah Power & Light Company at Salt Lake City to accept one with the Electric Investment Company at Boise, Idaho, as office attorney. Mr. Burton is a graduate of Bowdoin College in 1909 and of the Harvard Law School in 1912. After leaving law school he entered the office of Gage, Wilbur & Wachner, of Cleveland. Mr. R. A. Wilbur of that firm later took the position of general attorney for the Utah Power and Light Company and Mr. Burton moved to Salt Lake City with him.

MR. W. D. LINDSEY, advertising manager of the Western Electric Company, is the author of an interesting article in the December issue of the *Western Electric News*, entitled "Our Advertising—The 'Why' and 'How' of It." Mr. Lindsey describes in detail the work of the advertising department of his company, including the preparation of copy, the maintenance of an information bureau, the handling of exhibits, window displays, etc. He also discusses the question of whether advertising pays, and shows why it does.

DR. MILLER REESE HUTCHISON, E.E., Ph.D., chief engineer to and personal representative of Mr. Thomas A. Edison, has been appointed by the Secretary of the Navy, a member of the Naval Consulting Board, and also as assistant to the chairman, Mr. Edison. Dr. Hutchison is well known throughout Europe and America. He has been granted several hundred patents, among the most universally used of which are the acousticon to enable the deaf to hear, and the Klaxon warning signal. After receiving a classical education from private schools of Mobile, Ala.; the Marion Institute, Marion, Ala.; Spring Hill College, Spring Hill (Mobile), Ala., and the University Military Institute of Mobile, he attended the Alabama Polytechnic Institute, Electrical and Mechanical Engineering, class of 1897. The degree of E.E. was conferred by this college. The degree of Doctor of Philosophy was conferred by

Miller Reese Hutchison.

Spring Hill College, in 1914. He was chief electrical engineer of the Seventh and Eighth Lighthouse Districts during the Spanish-American War, engaged in laying mines and cables in the southern harbors, etc. Dr. Hutchison became associated with Mr. Edison in 1910, in the development of the Edison storage battery for use in submarines. In 1912, he was appointed chief engineer to and personal representative of Mr. Edison, chief engineer of the Edison Laboratories and Thomas A. Edison (Inc.). For a time during 1912 he assumed the duties of advertising manager of the Edison Storage Battery Company—when the battery was little known. He conducted what has gone down in the annals as one of the most successful campaigns of advertising ever undertaken. It involved the dictation, by Dr. Hutchison, of ten thousand words of advertising matter per day for one hundred successive days, and appeared in two or more page spreads in 26 weekly and 16 monthly magazines, as a series of signed letters addressed to the public. His extensive experience and tremendous capacity for hard work make him a very valuable acquisition to the Naval Consulting Board.

MR. EDWIN G. BOOZ, former statistician of the Produce Terminal Corpora-

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	Dec. 13	Dec. 6
American Tel. & Tel. (New York)	128½	128½
Commonwealth Edison (Chicago)	144	144
Edison Electric Illuminating (Boston)	242	240
Electric Storage Battery common (Philadelphia)	67	67
Electric Storage Battery preferred (Philadelphia)	67	67
General Electric (New York)	174¾	176
Kings County Electric (New York)	125	125
Massachusetts Electric common (Boston)	6¾	7
Massachusetts Electric preferred (Boston)	35	40
National Carbon common (Chicago)	150	150
National Carbon preferred (Chicago)	120	120
New England Telephone (Boston)	131½	131
Philadelphia Electric (Philadelphia)	27¾	27⅝
Postal Telegraph and Cables common (New York)	79	80¼
Postal Telegraph and Cables preferred (New York)	66	65½
Western Union (New York)	88½	87⅝
Westinghouse commoon (New York)	67¾	76¼
Westinghouse preferred (New York)	76	68¾

tion of Chicago, has recently organized the Business Research Service and has been made its director. This service is the first of its kind in the Central West and is designed to meet the new demand on the part of manufacturers, sales and advertising managers and advertising agencies for a skilled research service in the field of business.

MR. OSCAR S. STRAUS, one of the most prominent citizens and most successful business men of the city of New York, has been appointed by Governor Whitman chairman of the Public Service Commission of the First District of the State of New York. Mr. Straus has filled several diplomatic and official posts, having three times been Envoy Extraordinary and Minister Plenipotentiary to Turkey. He was born in Bavaria, December 23, 1850; lived in Columbus, Ga., for several years before coming to New York and was graduated from Columbia University in 1871. Later he was graduated from the law school and took a degree of A. M. in 1874. He practiced law from 1873 to 1881 and then became a member of the firm of L. Straus & Sons, importers of pottery and glassware, staying in the firm until 1906. Mr. Straus was appointed Minister to Turkey in 1887 and served till 1889, and again from 1898 to 1901. He was appointed a member of the Permanent Court of Arbitration in The Hague in 1902 to succeed former President Harrison. President Roosevelt appointed him Secretary of the Department of Commerce and Labor on December 17, 1906. He went to Turkey as Minister for the third time soon after leaving President Roosevelt's Cabinet in 1909, and served until December, 1910. Mr. Straus ran for Governor of New York on the Progressive ticket in 1912. In 1914 he was appointed chairman of an arbitration commission to decide the wage dispute between the Eastern railroads and the engineers. He was formerly president of the New York Board of Trade and Transportation, also of the National Primary League and of the American Social Science Association. He was vice-president of the National Civic Federation and the International Law Association.

OBITUARY.

MR. WILLIAM ANDREW CONNER, of Plainfield, N. J., died suddenly Monday, December 6, at his office in Perth Amboy, N. J. He was born in Baltimore, September 12, 1859. He began his business career in 1876, in Pittsburgh, in the oil refining business, in which he reached the position of assistant manager for the Standard Oil Company. In 1885 he took charge of the first plant built by the Standard Underground Cable Company in Pittsburgh, and from then to the time of his death he was the head of the manufacturing business of that company, including large plants planned and built by him in Pittsburgh, Pa.; Perth Amboy, N. J.; Oakland, Cal., and Hamilton, Canada. He was a director for 10 years and first vice-president since 1909. He was vice-president of the Perth Amboy Trust Company, in whose inception he had an active part. He has resided in Plainfield since 1904. He leaves his widow, who was Miss Tupper, of Michigan; a brother, Edward Conner, of Orange, N. J., and a sister, Mrs. Roake, of Brooklyn, N. Y. He was a cousin to Mr. O. T. Waring, of the Standard Oil Company, Mr. E. J. Waring, of the Standard Underground Cable Company, and the late Richard S. Waring, who was the founder of the Standard Underground Cable Company and inventor of "Waring" cables.

DATES AHEAD.

American Association for the Advancement of Science. Annual meeting, Columbus, O., December 27-31. Secretary, L. O. Howard, Washington, D. C.

Pan-American Scientific Congress. Washington, D. C., December 27-January 8. Assistant Secretary, G. L. Swiggett, Pan-American Union, Washington, D. C.

American Institute of Chemical Engineers. Winter meeting, Baltimore, Md., January 12-15, 1916. Secretary, J. C. Olson, Cooper Union, New York, N. Y.

Electrical Contractors' Association of Wisconsin. Annual convention, Hotel Wisconsin, Milwaukee, Wis., January 17-19, 1916. Secretary, Albert Petermann, 626 Lloyd Street, Milwaukee, Wis.

Western Association of Electrical Inspectors. Eleventh annual meeting, Hotel Sherman, Chicago, Ill., January 25-27, 1916. Secretary, W. S. Boyd, 175 West Jackson Boulevard, Chicago.

With the Electrical Manufacturers

Novelty Incandescent Lamp Company, Emporium, Pa., has completed its new plant at St. Marys, Pa. This plant is being devoted exclusively to the manufacture of tungsten lamps. Its capacity is 5,000 lamps per day.

Fancleve Specialty Company, Jamaica Plain, Mass., has issued a new bulletin describing its new tandem boxes. These fittings are very convenient where two or more outlets or switches are to be installed in a vertical gang.

A. Hall Berry, 97 Warren Street, New York, N. Y., has been appointed exclusive Eastern selling agent for the Macallen Company, to represent the latter in the New England States, New York, New Jersey and Pennsylvania.

Naugle Pole & Tie Company, 5 South Wabash Avenue, Chicago, Ill., is sending out folders calling attention to its excellent stocks of poles on hand. In view of the arrival of sleet storms, the advice to call on the company's superior shipping facilities is timely.

The R. Thomas & Sons Company, East Liverpool, O., has issued a booklet on the new Thomas suspension insulator No. 1141. This is of improved design and incorporates many features, giving added safety in long-distance high-tension power transmission. Sectional and perspective illustrations are shown.

The Minerallac Electric Company, manufacturer of insulating compounds and other electrical material, has moved its office and factory from 400 South Hoyne Avenue to 1043-45 Washington Boulevard, Chicago, where greater facilities have been provided to enable the company to handle its increasing volume of business.

Betts & Betts Corporation, New York City, has recently been awarded the contract for an extensive clock system for the Court of Appeals Building at Albany, N. Y. It is also stated that a self-winding time clock is to be installed for the Corsicana National Bank at Corsicana, Tex., which is expected to be one of the largest and most attractive installations of its kind in that section of the country.

Harvey Hubbell, Incorporated, Bridgeport, Conn., has sent out copies of a folder on the Hubbell Signalite cap. This is a combined attachment-plug cap and small pilot lamp particularly suited to the connection of heating appliances, since it indicates when the current is on and reminds the operator to cut off the current on leaving the work. Copies of the folder can be obtained on application to the company.

The Esterline Company, Indianapolis, Ind., has issued a bulletin on its new type G H graphic recording voltmeters and ammeters. These are of simple but good construction and of sufficient accuracy for use on commercial circuits; they are less expensive than the company's well known high-grade type E B graphic meters. The bulletin describes the elements of these instruments and illustrates them. They are made for portable or switchboard use.

The Universal Motor Company, Oshkosh, Wis., has issued bulletin No. 20 on Universal generating sets for rural lighting plants. These are self-contained units comprising an internal-combustion engine direct-connected to a generator. The outfit is of very simple design so as to adapt it for use by those not highly skilled in electrical practice. The bulletin describes the equipment and illustrates it and applications of it.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., issued folder No. 4321, in which meters for automobile testing are described and their particular advantages pointed out. Issue No. 24 of "Small Motors," published by the Small Motor Department of the company, shows a number of illustrations of the fractional-horsepower motor and some of its numerous applications. A view of the large

building devoted entirely to the manufacture of this type of motor is also shown.

Monarch Refillable Fuse Company, Incorporated, Buffalo, N. Y., has issued catalog No. 2. This gives full data on the various sizes and types of Monarch refillable fuses of the cartridge pattern, and also of the Monarch refillable Edison fuse plug. The Monarch alternating-current buzzer is also briefly described; this is intended for use in connection with bell-ringing transformers. The last page of the catalog illustrates and describes the new Monarch electric soldering iron. This iron is of unique construction and was described in our issue of October 2, 1915.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., has issued bulletin No. 1075-A on belted alternating-current generators, types AB and AH. The former type is made only in sizes up to 200 kilovolt-amperes and is of self-contained or bracket-bearing construction, especially adapted for high-speed machines. The type AH alternators are of the pedestal-bearing class and are built standard for ratings up to 625 kilovolt-amperes or still larger. The general construction of these machines is described and views shown of their parts and of the assembled units installed in various plants.

Fairbanks, Morse & Company, Chicago, Ill., has recently furnished and installed the complete equipment of a new power plant for the State School of Mines at Socorro, N. M. It consists of two semi-Diesel Fairbanks-Morse type Y oil engines. One of these engines is 50 horsepower and is direct-connected to a Fairbanks-Morse 37.5-kilovolt-ampere generator of 440 volts. This engine has sufficient power to operate all the machinery in the various buildings. The other engine is somewhat smaller and is used for generating direct current for light and laboratory purposes. The switchboard is supplied with the various instruments used in electrical measurements, and is perhaps the most complete of its kind in the Southwest.

Pettingell-Andrews Company, Boston, Mass., has issued a well illustrated booklet on indirect lighting fixtures, Curtis portable lamps and X-Ray show-window and direct-lighting reflectors. It shows typical units of pure indirect, luminous-bowl indirect and several forms of direct-lighting equipment, all including the mirrored-glass reflectors made by the National X-Ray Reflector Company, of Chicago, for which the Pettingell-Andrews organization is the New England agent. Quite a number of illustrations are shown of typical installations in a church, school, office, store, residence, show-window, industrial plants, etc., most of these being in New England. Principles and details of the indirect fixtures are also illustrated and briefly described.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, Pa., has ready catalog No. 40, covering apparatus for measuring low resistances and conductivities. A large variety of apparatus is described, including standard low resistances, standard resistances for carrying fairly heavy currents, Kelvin double-bridge equipments, variable standard low resistances, Hoopes' conductivity bridge and auxiliaries. The catalog also gives useful information regarding the use of the Kelvin double bridge and the Hoopes' conductivity bridge. The company has also issued bulletin No. 710, which describes and illustrates the peak-reading voltmeter, built according to the design of the Simplex Wire & Cable Company. This instrument affords a practical means for determining the maximum voltage on any alternating-current system.

Record of Electrical Patents

Issued by the United States Patent Office, December 7, 1915.

Prepared by Thomas Howe, Patent Attorney, 2 Rector Street, New York, N. Y.

1,162,747. **Insulated Support for Electrical Devices.** A. W. Burke, Wilmington, Del. Switch insulator cap.

1,162,765. **Holder for Crystal Detector.** J. J. Ghegan, East Orange, N. J. Arrangement and mounting of electrodes.

1,162,773. **Electric Furnace.** C. Hering, Philadelphia, Pa. Method of treating molten metal of high conductivity, such as iron or steel.

1,162,782. **Heater-Filter.** C. Joerin, Jr., and A. E. Joerin, Detroit, Mich. Faucet and electric heater switch interlocked.

1,162,788. **Grid Resistance.** D. L. Linquist, assignor to Otis Elevator Co., Jersey City, N. J. Grids spring-pressed into contact.

1,162,793. **Waterproof Switch-Joint.** W. E. McEldowney, assignor to Miller Electric Switch Co., Denver, Colo. Stuffing box and gland with waterproof packing about switch shaft.

1,162,804. **Spark-Plug Attachment.** A. L. Penquite, Marshalltown, Iowa. Spark plug combined with priming device.

1,162,830. **System for Signaling by Wireless Telegraphy Under the Quenched-Spark Method.** G. von Arco and A. Meissner, assignors to Gesellschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Arrangement, tuning, etc., of exciter, antenna and oscillation circuits.

1,162,831. **Electrical Switch.** O. S. Walker and I. F. Williams, assignors to O. S. Walker Co., Worcester, Mass. Pivoted switch controlling relative connections of coils.

1,162,837. **Door-Indicator.** F. Williams, assignor to Acme Register Co., Somerville, Mass. For registering when door is opened.

1,162,850. **Pendulum Electrode for Spark Plugs.** T. deRoode, New York, N. Y. Plug comprising swinging pendulum electrode having a fixed electrode spaced from it.

1,162,855. **Lightning Rod.** J. F. Goetz, Hartford, Wis. Branch-joint connection.

1,162,864, 1,162,865 and 1,162,866. **Electric Switch.** C. J. Klein, assignor to Cutler-Hammer Mfg. Co., Milwaukee, Wis. First patent: push-button, snap switch with egg-shaped, two-part casing. Second patent: snap switch with special stamped metal contactors. Third patent; modification of second patent.

1,162,890. **System of Train Control.** G. P. Thurber, assignor to Automatic Train Control & Signal Co., Pittsburgh, Pa. Block system having each track section comprising main and local blocks with train-controlled cab circuit.

1,162,897. **Dough-Raising Device.** B. Ames, Lowell, Mass. Compartment heated by thermostatically controlled lamp.

1,162,899. **Telephone-Indicator.** H. E. Beane, Bowling Green, Ky. Electromagnetically operated rock shaft and pointer.

1,162,918. **Electric Welding Apparatus.** W. E. Haskin, Flushing, N. Y. Automatic control of arcing electrode.

1,162,919. **Spark Plug.** F. E. Hawkins, Deerfield, Kan., assignor of one-half to G. W. Barnes. Outer electrode formed by hollow, tapering, inward extension of casing surrounding central electrode.

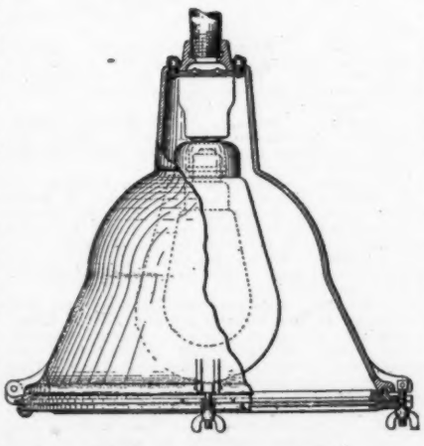
1,162,921. **Attachment Plug.** M. Herskovitz, Chicago, Ill. Manner of securing side contact to body.

1,162,931. **Level.** R. C. Kellogg and A. Johnson, New York, N. Y. Adapted to receive pocket flashlight to illuminate sight tube.

1,162,953. **Combined Bell and Buzzer.** O. H. Stuewe and L. M. Jansen, Milwaukee, Wis. Electromagnetic arrangement.

1,162,973. **Insulated Rail-Joint.** B. G. Braine, assignor to Rail Joint Co., New York, N. Y. Special arrangement of insulation.

1,162,974. **Incandescent-Electric-Lamp Fixture.** F. Buchanan, Syracuse, N. Y. Combined waterproof shade and socket for securing to conduit end. (See cut.)



No. 1,162,974.—Waterproof Fixture.

1,162,991. **Dynamo-Electric Machine.** J. B. Entz, Cleveland, O. Inclosed machine with rectangularly shaped frame.

1,162,992. **Pole-Changer.** C. J. Erickson, assignor to First Trust and Savings Bank Chicago, Ill. Electromagnetically vibrated pendulum closes circuit through two parts of divided battery alternately.

1,162,996. **Train-Wire Conductor.** A. J. Farrelly and G. B. Colegrove, Chicago, Ill. Details.

1,163,040. **Centrifugal Switch.** M. L. Severy, Arlington Heights, and G. B. Sinclair, Winthrop, Mass., assignors to Choralcelo Mfg. Co. Special provision for adjusting centrifugal contact spring and protecting from atmospheric interference.

1,163,063. **System of Automatic Block-Signaling for Electric Railroads.** G. H. Benjamin, New York, N. Y. Polyphase motor controls signal.

1,163,068. **Electromagnetic Switch.** C. W. Coleman and A. V. T. Day, assignors to Hall Switch & Signal Co., New York, N. Y. Polarized; for block-signal work.

1,163,069. **Railway-Traffic-Controlling Apparatus.** A. V. T. Day, assignor to Hall Switch & Signal Co. Car-controlling means responsive to potential difference between two contactors engaging stationary conductor.

1,163,070. **Relay.** A. V. T. Day, assignor to Hall Switch & Signal Co. Special structure for railway-signal work.

1,163,079. **Synchronizing Device.** L. Gaumont, assignor to Societe des Etablissements Gaumont, Paris, France. Differential between devices controls electric motor driving one of them.

1,163,084. **Electric Snap Switch.** M. Guett, assignor to Hart & Hegeman Mfg. Co., Hartford, Conn. Has special snap action.

1,163,092. **Timer or Current-Interrupter.** C. F. Kettering, assignor to Dayton Engineering Laboratories Co., Dayton, O. Special contact structure in ignition device.

1,163,114. **Insulator.** L. Stahl, Carey, O. Reversible porcelain cleat.

1,163,132. **Insulator Pin.** C. G. Ette, St. Louis, Mo., assignor to St. Louis Malleable Casting Co., St. Louis, Mo. Has inclined openings for securing spikes.

1,163,139. **Trolley-Retriever.** R. E. Gearhart, assignor to More-Jones Brass & Metal Co., St. Louis, Mo. Trigger releases pole support when trolley jumps wire.

1,163,147. **Individual Protective Arrangement for Interlocked Functions.** W. S. Henry, assignor to General Railway Signal Co., Gates, N. Y. Prevents operation of signal in railway system by improper current.

1,163,150. Motor-Controller. A. J. Horton, assignor to Cutler-Hammer Mfg. Co. Comprises interlocked push-button starting and stopping switches.

1,163,153. Electric Interlocking Protective Device. W. K. Howe, assignor to General Railway Signal Co. Railway-signal system; signal operation by current from improper source prevented.

1,163,154. Electric Controlling Device. W. K. Howe, assignor to General Railway Signal Co. Modifications of above.

1,163,163. Primary Electric Battery. G. A. Lutz, Cranford, N. J. Element comprises iron container with slits, permitting passage of electrolyte but not of depolarizer.

1,163,165. Safety Device for Elevators. A. Mueller, New York, N. Y. Disarrangement of cable or broken strand stops motor.

1,163,171. Cross-Protection Device. W. J. Plogsted, assignor to General Railway Signal Co. Railway-signal-operating circuit cannot be made when wires are crossed.

1,163,180. Means for Strengthening Weak Electrical Impulses. W. Schloemilch and A. Leib, assignors to Gesellschaft für Drahtlose Telegraphie M. B. H., Berlin, Germany. Strengthened D. C. impulses converted to A. C., reconverted to D. C. and recorder operated.

1,163,181. Lightning-Rod Coupling. E. A. Schmitt, assignor to Cole Brothers Lightning Rod Co., St. Louis, Mo. Metal connector for lightning-rod sections

1,163,182. Automatic Block-Signaling for Electric Railways. O. E. Stevens, assignor to the General Railway Signal Co. For systems employing closed track circuits and normally de-energized relays.

1,163,190. Railway Signal. E. Woltmann, New York, N. Y., assignor to Automatic Train Stop Co. Train-stop block system operating by cutting out sections of power conductor.

1,163,191. Ship's Telegraph. F. W. Wood and H. Laning, Petersburg, Ill.; said Wood assignor to Charles Cory & Son, New York, N. Y. Mechanical and electrical signal-transmitting means combined in one structure and operated in common.

1,163,192. Light-Projecting Apparatus. W. P. Adams, Syracuse, N. Y. Comprises incandescent lamp having spaced terminals of incandescing material producing nucleate arc of light adjacent reflector focus.

1,163,199. License-Plate Carrier and Signal. R. B. Baker, Galion, O. Tail light and license plate illuminator carried on motor-actuated bar for winding and unwinding signal flag.

1,163,201. Mechanical Sounder for Telegraph Systems. P. P. Banholzer, Philadelphia, Pa. Telegraph sounder clamped to telephone standard to transmit vibrations to telephone transmitter. (See cut.)

1,163,208. Lighting Fixture. F. C. Burkhart, Omaha, Neb. Semi-indirect; adjustable bowl-supporting band having fingers engaging supporting chains and carrying lamp sockets.

1,163,226. Electric Meter. E. Evans and H. Ziemendorff, assignors to General Electric Co., Schenectady, N. Y. Records amount of energy consumed in excess of specified quantity during times consumption rate exceeds predetermined value.

1,163,265. Casing for Dynamo-Electric Machines. A. C. Rutzen, Cleveland, O. Globular casing enclosing dynamo and driving motor mounted above it.

1,163,268. Means and Method for Varying the Voltage of Alternating Currents. E. H. Schwarz, assignor to General Electric Co. Connections are taken from either ends or mid points of delta-connected windings.

1,163,272. Spark Plug. G. T. Simmons, Janesville, Wis. Casing has at inner end an apron having series of concentric grooves.

1,163,274. Tracking Device. L. W. Southgate, Worcester, Mass., assignor to Auto Pneumatic Action Co. Adjustment between tracker and note-sheet in pneumatic musical instrument is electromagnetically controlled.

1,163,280. Long-Distance Water-Stage Recorder. J. C. Stevens, assignor to Leupold, Voelpel & Co., Portland, Ore. Float-controlled circuit operates controller at a distance.

1,163,281. Spark Plug. M. P. Sullivan, assignor to L. F. Benton Co., New York, N. Y. Casing divided into three superposed sections and special structure of central electrode.

1,163,286. Process of Recovering Zinc From an Acid Sulphite Solution. C. S. Vadner, Salt Lake City, Utah. Solution is electrolyzed, acid neutralized, and continuously electrolyzed to recover zinc and eliminate SO_2.

1,163,306. Regulating System. R. W. Armstrong, assignor to Safety Car Heating & Lighting Co., Newark, N. J. Variable-resistance potential-regulating apparatus for car lighting.

1,163,321. Electrical Water-Purifying Appliance. H. Clark, Kansas City, Mo., assignor of two-thirds to J. R. Green and T. T. Bathurst. Special structure of electrodes suspended from cover of tank.

1,163,326. Telephone Attachment. D. Y. Donaldson, Denver, Colo. Receiver and transmiter mounted on crank arm, normally face downwardly, and are simultaneously moved to operating position.

1,163,329. Filament for Incandescent Electric Lamps. T. A. Edison, assignor to General Electric Co. Tungsten vaporized by electric discharge *in vacuo* and deposited on surface, from which film formed is afterward separated.

1,163,337. Production of Cathode-Forming Sheets. E. A. Guggenheim, New York, N. Y. Special structure of blank for forming the sheets.

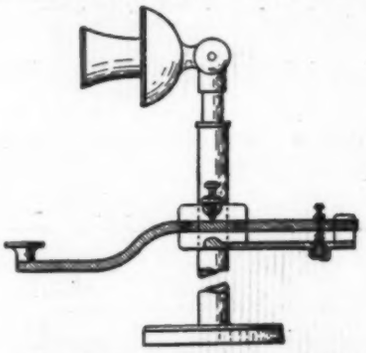
1,163,342. Method of Drying and Impregnating Electrical Conductors. D. Hurley and J. E. O'Shea, New York, N. Y. Covering heated externally and internally by passing current through conductor, under atmospheric pressure, pressure reduced and impregnated compound forced into cover while heated.

1,163,346. Signal System. C. H. Johnson, Boylston, and G. E. Johnson, Worcester, Mass. Series push-button control for elevator, etc., signals.

1,163,349. Combined Push-Button-Controlled Door Bell and Illuminating Sign. G. Kimball, Ouray, Colo. Particular structure of door plate carrying lamp, sign and push-button controlling lamp and bell.

1,163,353. Globe for Street Lighting. O. G. Luyties, Sharon Springs, N. Y. Particular arrangement of translucent and transparent portions.

1,163,371. Fastening Device for Electrical Conductors. J. Schade, Jr., assignor to Fahnestock Electric Co., New York, N. Y. Spring-grip connector for joining conductors.



No. 1,163,201.—Telegraph-Telephone Sounder.

1,163,372. Spring Fastening Device. J. Schade, Jr., New York, N. Y. Modification of above for binding-post.

1,163,388. Switch Box. J. H. Williams, East Cleveland, O. Has universal engaging plate with buttons stopping plate in one of two operative positions.

1,163,390. Automatic Telephony. W. M. Bruce, Jr., assignor to International Automatic Telephone Co., Springfield, O. Arrangement of terminals and wipers in automatic switch.

1,163,412. Pool-Table Pocket Light. H. Jorstad, Stanhope, Iowa. Lamp lighted when ball is in pocket.

1,163,424. Alternating-Current Motor Starter. J. C. Lincoln, assignor to Lincoln Electric Co., Cleveland, O. Comprises transformer and oscillating switch biased to central "off" position.

1,163,434. Process for Making Mica Plates. M. Meirowsky, Porz, Germany. Mica sticking machines fed with aid of aspirated air.

1,163,444. Hanger for Electric Lamps. H. L. Newell, Paris, Tenn., assignor of one-half to E. S. Wiggins, Paris, Tenn. Comprises spring-actuated ratchet reel for suspending cord for incandescent lamp.

1,163,446. Lamp Socket. T. O'Donnell, Ironwood, Mich. Special two-part structure of key socket.

1,163,468. Process for Determining the Nature of the Subsoil by the Aid of Electricity. C. Schlumberger, Paris, France. Difference of potential applied to two points of surface of tract and distribution of potential compared with that for homogeneous soil.

1,163,469. Location of Ores in the Subsoil. C. Schlumberger. Ores which conduct electricity similar to metals located by observing differences of potential at surface of soil upon passing current through it.

1,163,473. Synchronizer. M. L. Severy, Arlington Heights, Mass. Friction drive automatically varied by electromagnetic means.

1,163,474. Life Boat. T. F. Shanahan, Jersey City, N. J. Special provision for storage battery, propellers, fans, signals, etc.

1,163,498. Manufacture of Metallic Amides, Cyanamides and Cyanides. E. A. Ashcroft, London, England. Cyclic, electrolytic process for producing nitrogen compounds of alkali and alkali-earth metals.

1,163,501. Electric Generator. J. Bell, Cincinnati, O., assignor of one-half to G. W. Eisenhohr. Field and armature on separate crank shafts are driven in opposite directions from same crosshead.

1,163,502. Train-Stopping Apparatus. V. E. Bock, Pharr, Tex. Mechanism of motor-operated valve.

1,163,514. Supply of Energy to Electric-Railway Systems. C. H. Douglas, Patcham, England. Sectional-conductor system; potential in a section controlled by train in preceding section.

1,163,515. Money-Receiving Apparatus. H. A. Drew and G. M. Mazza, Weehawken, N. J., assignors to Coin Device & Signal Co. For telephones, etc.; distant signal controlled by coin denomination and distant means for controlling coin deposit.

1,163,536. Electric Water-Heater. L. C. Henriksen, Portland, Ore. For connection to water system; heating element connected by impact of water when valve is opened.

1,163,539. Telegraph. A. Hjort, New York, N. Y., assignor of one-fourth to H. Japp. Generators of different frequencies selectively connected to line; receiver comprises electromagnet operating vibrators having frequencies corresponding to generators.

1,163,543. Rotary Blower. R. A. Ilg, Chicago, Ill. Mounting of motor in special structure.

1,163,565. Automatic Web-Handling Apparatus. L. H. A. Schwartz, Brookline, Mass. Tentering machine; selvage-operated device controls electric motor-driven adjustment of carrier.

1,163,568. Electric Spark Gap. F. G. Simpson, Seattle, Wash. Particular structure of air-tight spark gap.

1,163,595. Track Apparatus for Signal or Stop Systems. A. Gollos, Chicago, Ill. Connection to contact rail is broken if rail is displaced.

1,163,605. Gyroscopically Controlled Torpedo. H. W. Shonnard, assignor to Crucible Steel Co. of America, Pittsburgh, Pa. Steering mechanism of automobile torpedo controlled by electric motor gyroscope.

1,163,607. Automobile Torpedo. H. W. Shonnard, assignor to Crucible Steel Co. of America. Launching tube has conducting elements for closing circuit through electric mechanism of torpedo.

Patents Expired.

The following United States electrical patents expired on December 13, 1915:

615,669. Thermostat. I. F. Beers and C. Beers, Rochester, N. Y.

615,673. Method of and Apparatus for Electrically Transmitting Power. C. S. Bradley, Avon, N. Y.

615,686. Electric Lamp. N. S. Doe, Jersey City, N. J.

615,699. Electroplating Apparatus. J. E. Hartley and H. E. Hartley, Birmingham, England.

615,731 and 615,732. Dynamo-Electric Machine. W. M. Mordey, Loughborough, England.

615,762. Railway-Crossing Signal. J. D. Taylor, Chillicothe, O.

615,814. Electric Firing Device for Ordnance. A. T. Dawson and G. T. Buckham, London, England.

615,896. Vacuum Insulator for Electric Conductors. J. A. Poche, New Orleans, La.

615,904 and 615,905. Electric-Lighting Apparatus for Railway Cars. W. F. Richards, Buffalo, N. Y.

615,927. Electric Arc Headlight. W. G. Wagenhals, Dayton, O.

615,940. Apparatus for Depositing Metal on Tubes or Pipes. W. Wright, Acocks Green, England.

615,952. Alternating-Current Generator. C. S. Bradley, Avon, N. Y.

615,953. Controlling Alternating-Current Motors. C. S. Bradley.

615,954. Changing Period and Phase of Alternating Currents. C. S. Bradley.

615,966. Trolley Replacer for Electric Railways. L. A. Cowles, Randolph, Mass.

616,035. Electric Motor. J. L. Thoma, Kansas City, Mo.

616,046. Telephone Switchboard. T. F. Ahern, Detroit, Mich.

616,061. Trolley-Wheel Replacer. G. E. Mittinger, Jr., Cleveland, O.